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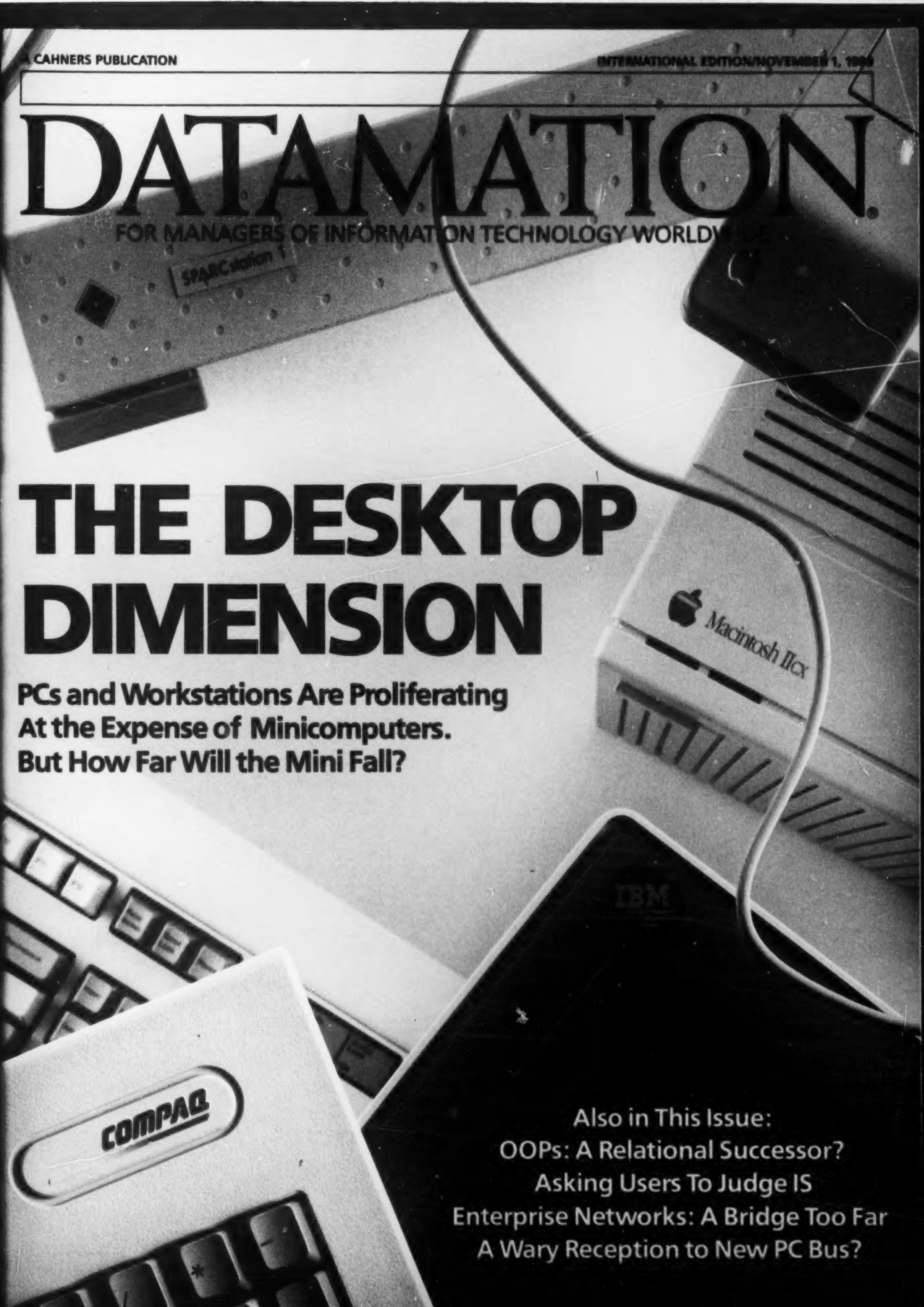
DATAMATION®

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE



THE DESKTOP DIMENSION

PCs and Workstations Are Proliferating At the Expense of Minicomputers. But How Far Will the Mini Fall?

Also in This Issue:

OOPs: A Relational Successor?

Asking Users To Judge IS

Enterprise Networks: A Bridge Too Far

A Wary Reception to New PC Bus?

NOV. 1, 1989

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NUMBER 21

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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BY BOB FRANCIS For the first time in the 16 years we've surveyed the spending plans of mini and microcomputer users, minicomputer spending is expected to drop. But, the PC industry is back in shape, the workstation world is exploding, networks are multiplying and UNIX is taking off.

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BY PARKER HODGES Object-oriented technology seems to be going down a path that relational technology traveled some 10 years ago. With scholarly champions, start-up developers and some interest from major computer and software companies, object-oriented database management systems are making headway, especially in complex applications. Will these databases ever replace relational technology for IS applications?

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BY MARK WALLER A poorly designed computer center can reduce the efficiency of the processors you put in it by as much as 30%. In approaching computer room construction, you may want to focus on the bid and spec or the turnkey methods. Either way, coordination is the name of the game.

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BY JEFF MOAD More and more IS executives are surveying their users to find out if they are satisfied with the IS services. Often, IS chiefs find the answer is no.

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BY BOB FRANCIS AND JOHN McMULLEN Companies using large numbers of PCs in critical applications are beginning to go outside for PC service and support. Third-party vendors offer the high level of service that customized PCs and complex LANs require. But bringing in an outsider creates challenges of its own.

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Special supplement, not included in all issues. **102-1**

INSIDE DATAMATION

The Expanding Universe of Computing

Perhaps the most fascinating aspect of this issue's cover story, "The Desktop Dimension," in which we survey users of mini and microcomputers, is its hard evidence for growth in the market for personal computers and workstations. This may sound almost trite given the well-known and more-often-than-not phenomenal expansion of this market in recent years. But what isn't so obvious is the larger picture this current growth trend may suggest.

More people are doing more things with more computing power than ever before. Contrary to those who have been predicting consolidation and maturity in the computer industry, the data from the latest DATAMATION/Cowen & Co. survey suggest an expanding universe of computing; one not necessarily defined by machine type; and one, as a whole, that is only just beginning to develop.

"The conclusion that PCs and workstations have spread beyond the space they formally occupied in the IS strategies of many user organizations . . . is inescapable," writes Bob Francis, DATAMATION's Dallas bureau manager and PC writer. PC shipments are expected to rise 11.3% between July 1989 and June 1990, while workstations are expected to climb a whopping 27.3%. Both are seen as cutting into anticipated shipments of minicomputers, which are expected to fall 10.5% during the same period. Yet, the growth rates in PCs and workstations could be the envy of many other industries.

FRANCIS: The influence of the PC is spreading throughout corporations.

Photograph by Dave Bradley

Even though the increased expectations for PCs and workstations may be taking a bite, albeit a temporary one, out of intended minicomputer purchases, the growth in these systems is strong enough to show that computing itself is spreading within corporations. And this expansion is occurring without any major breakthroughs in applications software or significant changes in the way these machines are being used. Just imagine what the growth might be if, or when, these two factors experience positive change.

So, the new DATAMATION/Cowen & Co. survey has an underlying message of significance beyond the numbers: the industry's glass is truly only half full.

Micro Channel versus EISA and the Service Quotient

Our continuing focus on PC market analysis extends to two other stories by Francis in this issue. In "A Wary Reception to PC Bus Debut?," Francis reports that few technical differences separate the IBM PS/2 Micro Channel bus architecture from that of the alternative Extended Industry Standard Architecture (EISA) bus due soon from Compaq Computer Corp. and others. Still, he finds, users are choosing Micro Channel for reasons unrelated to the bus' technical merits: the availability of add-on boards and peripherals support.

And in "New Demands on PC Support," Francis and John McMullen— DATAMATION's new associate editor specializing in PC software—reveal that many corporations are adopting new PC service and support strategies. Flush with thousands of PCs in some cases, many companies no longer want to directly handle service and support for their PCs. But in going to an outside supplier for such services, IS managers are finding that they have to manage a new and often complex relationship.

David R. Brousell, Executive Editor

DATAMATION

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THE DESKTOP DIMENSION

The PC industry is back in shape. The workstation world is exploding. Networks are multiplying. And UNIX is taking off. All are propelling desktop systems into the realm of minicomputers.

BY BOB FRANCIS

Desktop computing has entered a new dimension in the offices, plants and factories of U.S. users. Powered by high-performance computer chips, smartened by standard operating systems, tooled with sufficient application software and networked in large numbers, desktop systems in the form of high-end personal computers and full-range workstations are taking over enterprises formerly dedicated to building their IS infrastructures on minicomputer platforms.

The conclusion is inescapable that PCs and workstations are being thought by IS strategists as much more than glorified typewriters, gee-whiz calculators and electronic sketch boards—at the expense of minicomputers. For the first time in the 16-year history of our annual survey measuring U.S. users' intentions to buy micro and minicomputers, purchases of minis are expected to decline. At the same time, investments in PCs, workstations and other key elements of distributed computing—networks and databases, for example—are on their way up.

Just how far down and high up will different market segments go? Survey results indicate that the dollar value of minicomputer shipments will fall 10.5% between July 1989 and June 1990. Monies spent on workstations will climb 27.3%. The dollar value of PC shipments is expected to rise 11.3%. Networks linking minicomputers and workstations are set to jump 28%; those tying PCs are slated to rise a stunning 44%. Applications for minicomputers and workstations also are on the ascent, as the survey results point to a 19% jump in the dollars spent on database software and a 13% rise in on-line transaction processing (OLTP) systems purchases.

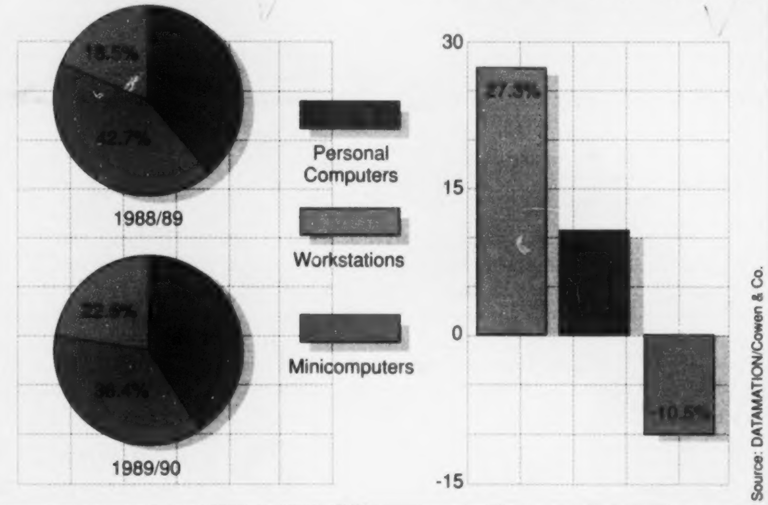
The Undeniable Dominance of Desktop Systems

Users will spend more on PCs than on minicomputers...

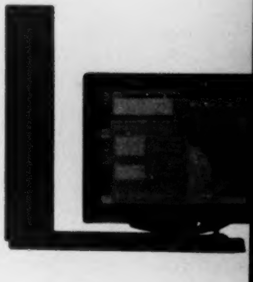
% OF NEW SYSTEMS PURCHASES (IN DOLLARS)

Propelling PCs and workstations to double-digit growth.

PROJECTED SHIPMENT GROWTH TO U.S. CUSTOMERS (IN DOLLARS)



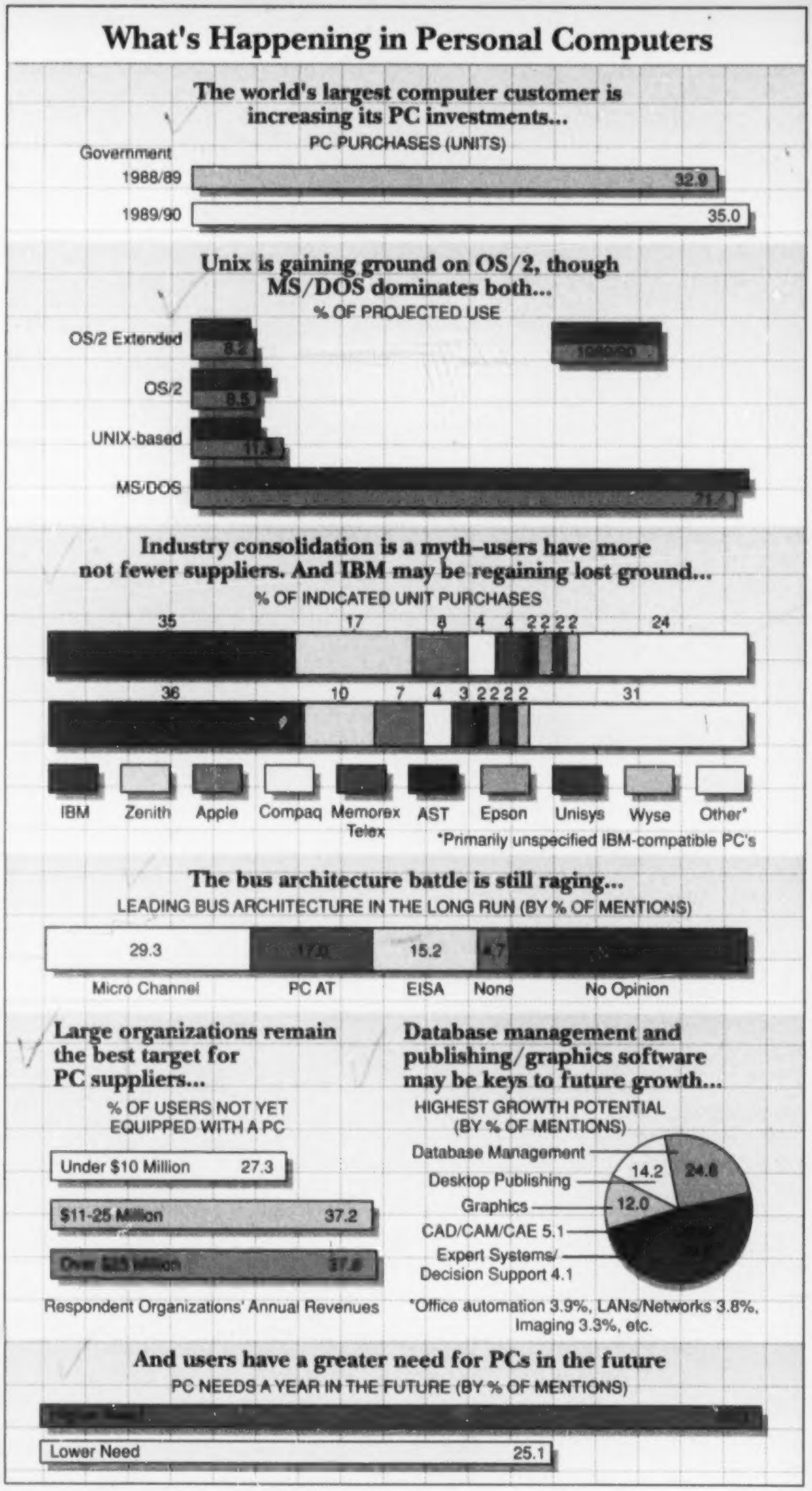
Source: DATAMATION/Cowen & Co.



High-end PCs and workstations are taking a rising share of the IS dollar.

This year's survey, based on the answers to questionnaires sent to 65,000 DATAMATION subscribers in the United States, was conducted by Cowen & Co. during late summer. The Boston-based financial securities firm, which specializes in high-technology and biotechnology companies, has performed the Mini/Micro survey annually since 1973. This year's sample of user responses, as in years past, drew from a cross section of U.S.-based users by industry (including government) and geography.

Although DATAMATION readers making up this survey do not necessarily constitute a scientific sampling of the U.S. user community, survey results are true indicators of the directions IS managers



should be leading their organizations. Managers of enterprises that are multinational or foreign in nature, however, should bear in mind that the sample does not measure trends outside the United States.

What the World Is Coming To

The responses from the 4,700 users that participated in this year's poll reveal a number of far-reaching trends likely to shape the course of the U.S. computer industry—and perhaps the world stage—in 1990 and beyond. Chief among them are:

- A dramatic improvement in the health of the U.S. PC market.
- A significant growth in networks and networked-based applications.
- Wide use of multiple—not single—PC suppliers for any single user organization and increased pressure on PC prices.
- An allegiance to existing PC standards, with MS/DOS holding its ground against OS/2.
- A continued dearth of any breakthroughs in application software—save, perhaps, in the area of database management—that would propel the industry upward at the clip that Lotus Development Corp.'s Lotus 1-2-3 accelerated the PC industry in its early days.
- A rapid consolidation within the ranks of workstation and minicomputer suppliers.
- Big gains for UNIX and reduced instruction set computing (RISC), the processor architecture most closely associated with its use.

The survey also reveals changes in the attitude users are displaying toward their suppliers of PCs, workstations and minicomputers. Of the top three U.S.-based suppliers of all such systems, IBM fares best on the survey—reversing some downward spirals seen on past surveys. Digital Equipment Corp. loses ground—due to the absence of a high-end product in its minicomputer product mix and the newness of its PC and RISC product lines. Unisys Corp. shows slippage nearly across the board—despite being on the right side of UNIX.

Here is how some other key suppliers fare:

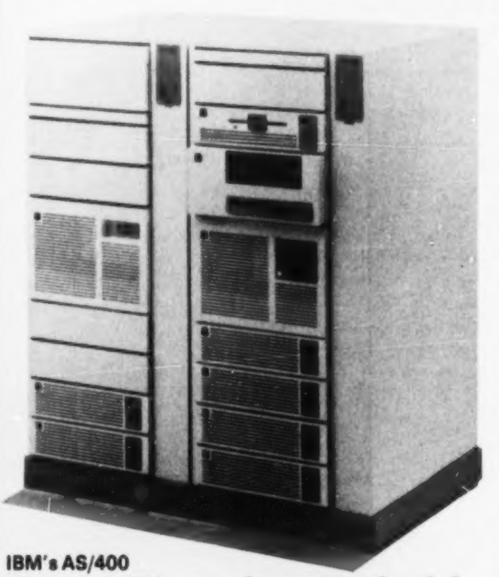
- Compaq Computer Corp., while holding on to its position as the No. 2 PC supplier (after IBM), faces challenges on pricing, product positioning and distribution fronts.
- Apple Computer Inc. continues to get high grades among PC users for ease of use, but its influence in PC networks is waning.
- Sun Microsystems Inc., despite its inability to predict quarter-to-quarter financial performance, exhibits strength in offering customers the features that many believe factor most in future system-purchasing decisions: standards (UNIX), networking and performance.

- Hewlett-Packard Co. shows some surprising agility—dodging IBM's AS/400 bullet, flexing its peripherals muscle and capturing a fair share of its customers' PC business. But its workstation line (both homegrown and acquired) lacks the kind of muscle expected of the world's No. 1 supplier of such systems.

PCs Regain Their Strength

The U.S. PC market is beginning to flex the sort of muscle it showed before last year's weak spell. The recovery no doubt is due to the 32-bit semiconductors coming from the likes of Intel Corp. and Motorola Inc., which are powering today's high-performance PCs. In last year's survey, users indicated they would need 5% fewer PCs between July 1988 and June 1989 than they had bought in the previous year. But in this year's tally, they're saying they intend to buy 3% more PCs by mid-1990 than they bought by mid-1989, which translates into 11% growth in dollars because of the h higher prices for today's PCs.

What accounts for the wild swing in PC purchases? Users were waiting for the right product to come along before they were willing to take desktop systems into a new dimension of corporate computing. That right product appears to be PCs based on Intel's 80386 32-bit chip. For example, demand for 80386 systems made by Compaq—one of the earliest PC makers to jump on the 32-bit bandwagon—jumps 10 to 1,400 units among users polled in this year's survey.



IBM's AS/400 will dominate IBM minicomputer sales over the next 12 months.

The 80386 chip also claims some responsibility for the phenomenal growth in workstations detected on this year's survey. Because the line between PCs and workstations is blurred, the survey counted those 80386-based systems priced above $7,500 as workstations. Those below that price were tallied as personal computers.

The wholesale rush to high-end PCs would seem to bode well for big time players like Compaq and IBM, but the survey results highlight another surprising trend: the rise of "others" as important PC suppliers. "Others," so christened by researchers because they lack enough market share to be identified by name, are grabbing greater and greater portions of users' PC unit purchases. "Others," like Dell Computer Corp., Everex Systems Inc., NEC Corp. and Packard Bell, to name a few, is expected to capture 31% of the PC purchases made by surveyed users between July 1989 and June 1990—up seven points from the 24% share they held during the last 12 months. The only brand name PC supplier that seems somewhat immune to the "others" invasion is IBM, whose market share actually may increase from 35 to 36% by next June.

The "others" phenomenon suggests two important changes in the way IS managers buy PCs. First, such managers may actually be seeking more—not fewer—PC suppliers. And two, they may be far more concerned with price than compatibility. Recent evidence, part anecdotal and part quantitative, points to such sweeping changes.

American Airlines Inc. recently ordered 50,000 PCs—not from a single supplier, but from a trio of them: AT&T, IBM and Tandy Corp. Although all of the PCs purchased by the airline during a two-year period will be based on 80386 technology, not all of them will feature the same bus architecture. Some will have the data highway scheme espoused by IBM known as Micro Channel Architecture (MCA). Others will be based on the traditional Advanced Technology (AT) bus—known in some circles as the Industry Standard Architecture (ISA). And some may b bear the extended version of that architecture, EISA.

What PC Buyers Want

Price, the chief selling point for "other" PC suppliers, has emerged as the biggest single criterion used by IS managers in buying PCs in all but three cases. That's a far cry from as little as three years ago, when IBM-compatibility ranked as the major concern of PC purchasers. Then, 24% of users mentioned compatibility as an issue; today, barely 10% worry about it. Meanwhile, the price users pay for systems has skyrocketed in importance. More than 30% of users mention it as a major factor in making today's PC investments; just 20% listed it as such in 1986.

The PC suppliers that so far have managed to compete on the basis of something other than price are Apple, Compaq and HP. But there's no telling how long they will be able to rise above the price wars.

Although Apple's Macintosh system is built on proprietary technology primarily focused on ease of use, Apple's customers are still very price sensitive. In fact, buyers of Macintosh machines in our survey base their purchasing decisions on cost nearly as often as they base them on the Mac's superior graphics interface. This behavior among Apple buyers may explain why the Cupertino, Calif., computer maker is losing velocity in one market but is picking up speed in another. This year's survey shows Apple's share of PC units bought dropping from 8 to 7%, while the number of sites buying them is increasing from 7 to 8%.

For Compaq, a Texas tornado known to cloud some Big Blue skies in the past, this year's survey hints at a changing weather pattern. The Houston-based company built its success ($2 billion in annual revenues) and its profits ($255 million) on product reputation, not on prices; on PCs, not on other products; on retail distribution, not on direct sales. And those strategies probably will maintain Compaq's forceful presence in the corporate marketplace—supporting survey data that shows the company holding onto its share of several PC market segments. But for how long?

Compaq will be hard pressed to sustain its momentum as users become more price sensitive and as "other" suppliers step up their attack of the high end of the PC market—Compaq's domain—with 80386-based PCs of their own. For the moment, Compaq seems to be banking more on its future EISA-based products than on anything else to maintain its strength. Company executives, in fact, seem to have ruled out the possibility of expanding Compaq's distribution channels beyond third parties like retailers—even though the survey points to opportunities for PC suppliers that sell directly to customers like the U.S. government.

Important Criteria in Workstation Selection

1. System quality/reliability
2. Prior system compatibility
3. CPU performance
4. Vendor reputation/financial strength
5. Price/cost of ownership

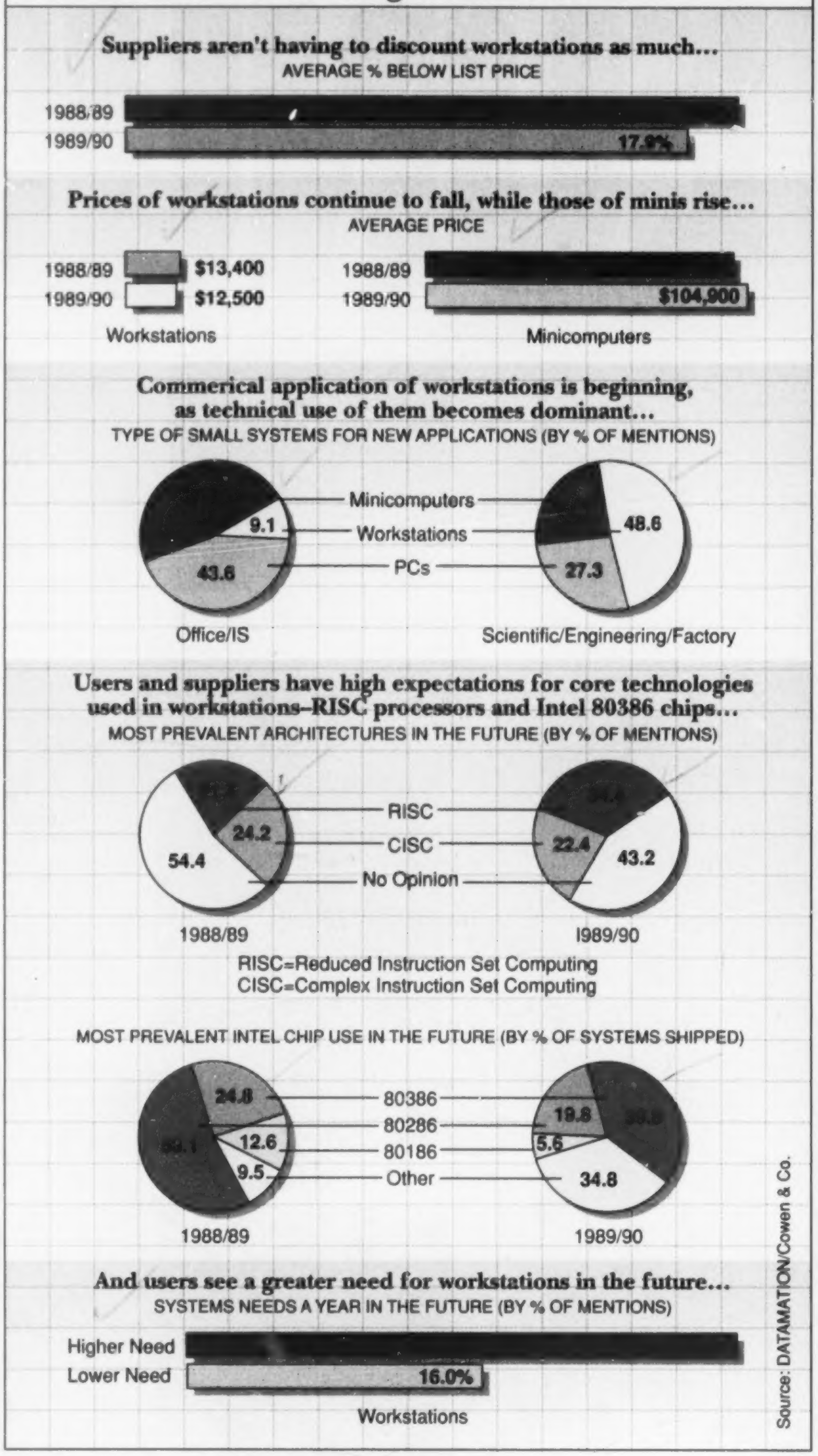
Catching the Right PC Bus

EISA, the bus architecture that IBM-compatible PC makers are pushing, may or may not be a big hit among major PC users. Although no EISA-based products existed at the time users responded to this year's survey, enough publicity on the subject apparently had been generated to make an impression. Slightly more than 15% of surveyed users believe EISA will emerge as the dominant architecture for PCs, yet twice as many expect IBM's alternative, MCA, to be the data path that tops the bus schedule.

While the move to a wider bus architecture for 80386-based PCs seems to be under way, there doesn't seem to be any rush to a new operating system for those high-performance PCs. Support for OS/2, the operating system codeveloped by Microsoft Corp. and IBM for 80286-based and 80386-based machines, is weak at best. Enthusiasm for OS/2's predecessor, MS/DOS, remains high. Amazingly, users plan to use MS/DOS 71.4% of the time in the future. If any new PC operating system poses a threat to MS/DOS, it's UNIX. Between our 1988 and 1989 surveys, the number of users who expect to use UNIX for their PCs jumps from 8.9 to 11.9%, while those who have their sights set on OS/2 or OS/2 Extended Edition drops from 18.1 to 16.7%.

Do these results bode ill for MS/DOS and OS/2 creator Microsoft? Well, yes and no. Yes, in that it means OS/2 may not be raining down buckets of revenue on the Redmond, Wash.-based company anytime soon. No, for two reasons: MS/DOS royalties keep the company well in the system software chips, and the success of Microsoft's applications software ensures growth. Microsoft's Excel and Multiplan applications, for example, garner nearly twice as large a share of the PC spreadsheet market in this year's

What's Working for Workstations



Suppliers aren't having to discount workstations as much...

AVERAGE % BELOW LIST PRICE

Prices of workstations continue to fall, while those of minis rise...

AVERAGE PRICE

Commerical application of workstations is beginning, as technical use of them becomes dominant...

TYPE OF SMALL SYSTEMS FOR NEW APPLICATIONS (BY % OF MENTIONS)

Users and suppliers have high expectations for core technologies used in workstations–RISC processors and Intel 80386 chips...

MOST PREVALENT ARCHITECTURES IN THE FUTURE (BY % OF MENTIONS)

RISC=Reduced Instruction Set Computing
CISC=Complex Instruction Set Computing

MOST PREVALENT INTEL CHIP USE IN THE FUTURE (BY % OF SYSTEMS SHIPPED)

And users see a greater need for workstations in the future...

SYSTEMS NEEDS A YEAR IN THE FUTURE (BY % OF MENTIONS)

Source: DATAMATION/Cowen & Co.

survey as they did a year ago. Still, Lotus retains 70% of that market.

Microsoft officials expect further growth in applications software, which last year accounted for 42% of the company's $803 million in sales. Microsoft is hopeful that a drop in the price of memory chips used in PCs will spur sales of OS/2, a memory-hungry operating system. Many industry observers had predicted that the demand for OS/2 would be stimulated by its Presentation Manager interface, but there's little evidence in the survey to support that belief. PM meets little user friendliness in this year's survey—only 11.5% of prospective OS/2 users intend to use the interface by the end of 1990.

Use of graphics workstations is increasing, particularly in technical applications.

That Presentation Manager and OS/2 are receiving the cold shoulder from users may spell trouble for the low end of IBM's System Applications Architecture (SAA) strategy. OS/2 is one of the key operating systems in the SAA world, the others being positioned in the midrange (OS/400) and the high end (MVS and VM). Lack of interest in OS/2, if it exists, may be offset in part by IBM's success in networking—a key function if it's to persuade users to develop SAA applications across a range of computer platforms. Survey results indicate that IBM has 10.2% of the local area network (LAN) market for PCs and 19.3% of the market for LANs connecting workstations and minicomputers.

IBM's growing presence in mini LANs reflects, in part, the success of its AS/400 midrange (aka minicomputer) system. The family of AS/400 products, introduced in June 1988, now accounts for three-quarters of IBM's midrange shipments to surveyed users. Moreover, the AS/400 continues to propel IBM upward in the U.S. minicomputer market. In the future, 38.5% of users surveyed say they will regard IBM as their chief minicomputer supplier—up more than five points from the 33.2% of users who currently regard Big Blue as such. The largest slice of AS/400 purchase plans continues to be made by companies with annual revenues in the $11 million to $250 million range. Interest in the midrange system among bigger companies, though, is also increasing. Nearly 15% of institutions with revenues above $250 million plan to buy an AS/400 this year or next—up from 9% in last year's survey. Surprisingly, support for the AS/400 among small companies—a class of users specifically targeted by IBM when it introduced the machine—is down to 5.7% from 6.3%.

More astounding is the lift in minicomputer/workstation shipments that IBM seems to be getting from the AS/400 and other products—System 3X, RT workstations and high-end (model 70 and 80) PS/2s. In the 12 months that began in July 1989, IBM's share of survey respondents' minicomputer/workstation purchases is expected to soar from 27.8 to 39.4%.

The Price of Success

So who's paying the price for IBM's midrange success? Evidence in the survey points to Digital as the main victim. And right now the No. 2 computer maker's tab looks steep. Item A on that bill shows that nearly twice as many Digital customers are considering purchasing an AS/400 today than they were a year ago. But the number still remains small—only 8.6% of prospective AS/400 customers today regard Digital as their chief supplier. Item B indicates that where an AS/400 is expected to replace a previously installed non-IBM system, Digital systems are the ones getting the boot 19% of the time—up from 13.5% a year ago. Item C involves another minicomputer player, as well. Existing customers of Digital are almost as likely to buy or at least evaluate an AS/400 as are customers of troubled Wang Laboratories Inc.

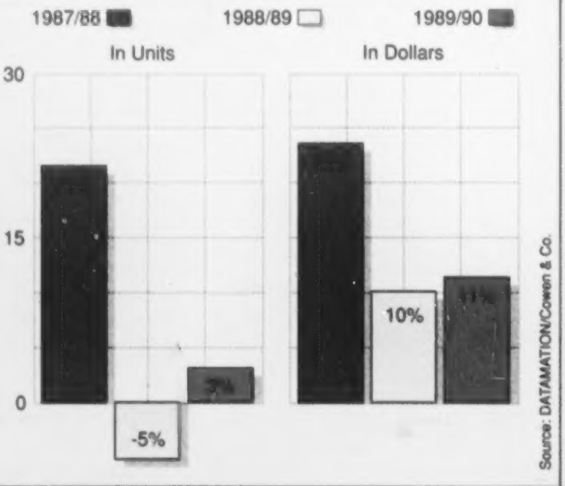
All of those items add up to market-share troubles for Digital. Although more users in the survey state that the Maynard, Mass., company will be their chief minicomputer/workstation supplier in the future (22.7% tomorrow vs. 21.4% today), these once and future Digital users plan to spend more money with its competitors between July 1989 and June 1990 than they had in the previous 12 months. Consequently, Digital's share of systems purchases is expected to decline to 31.9%, down from 40.5% a year ago.

Digital's own product line, as much as competition

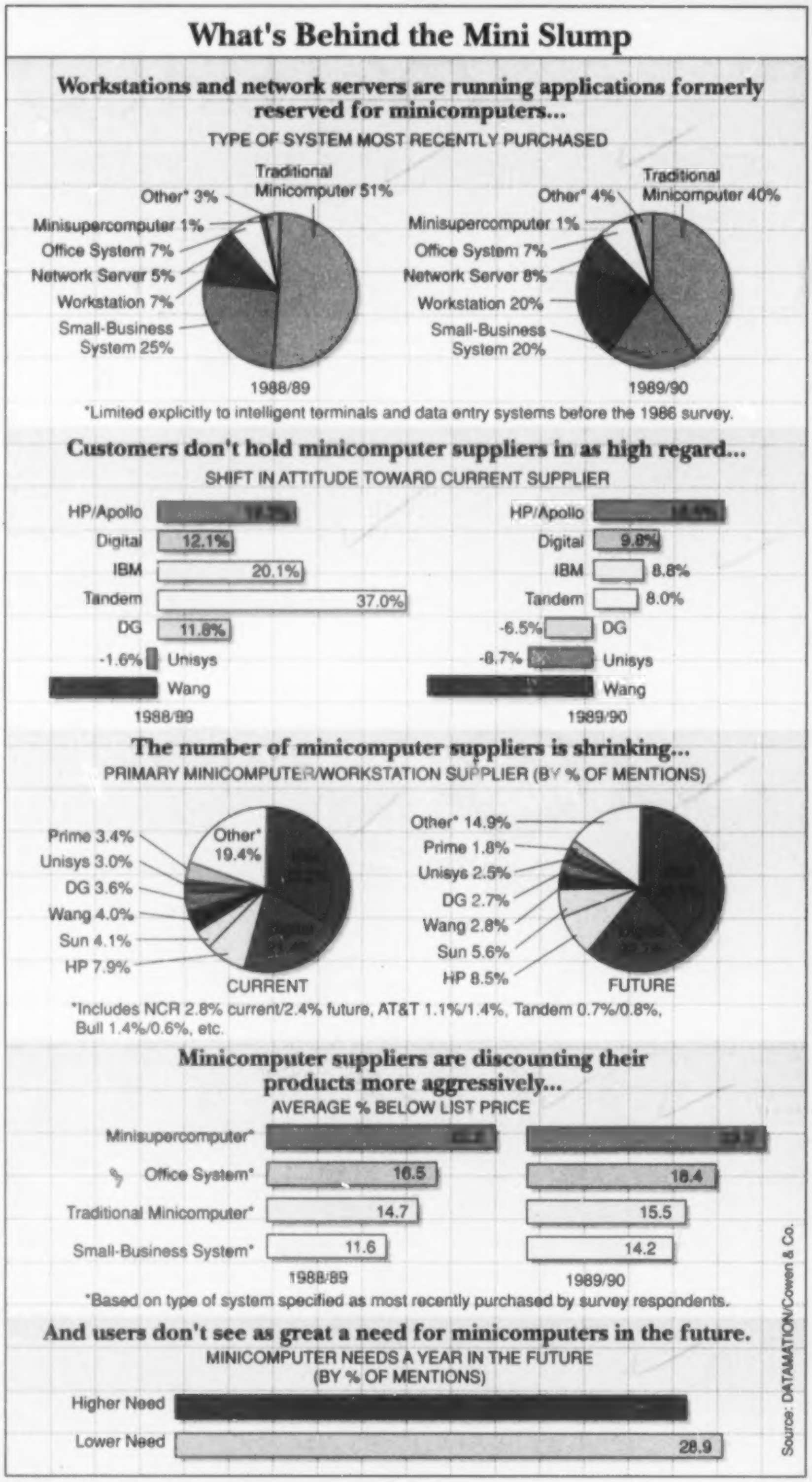
The PC Industry Returns to Health

After failing a year ago, U.S. shipments of personal computers look much stronger.

PROJECTED U.S. PC SHIPMENT GROWTH



Source: DATAMATION/Cowen & Co.



What's Behind the Mini Slump

*Limited explicitly to intelligent terminals and data entry systems before the 1986 survey.

*Includes NCR 2.8% current/2.4% future, AT&T 1.1%/1.4%, Tandem 0.7%/0.8%, Bull 1.4%/0.6%, etc.

*Based on type of system specified as most recently purchased by survey respondents.

Source: DATAMATION/Cowen & Co.

from anyone else's, could account for the tumble. When the survey was taken, the company lacked a high-end system capable of generating big revenue gains. It also had just introduced a revamped 6000 series of minicomputers about which survey respondents probably knew very little. And the product line that users could evaluate in 1989 differs markedly from the one they saw in 1988. It contains a lot more workstations, whose prices fetch fewer dollars per system than their older minicomputer predecessors.

The survey does, however, point to some areas where Digital may be exacting a price from others. In the OLTP system market, where minicomputers and mainframe systems are used heavily, Digital's share jumps from 5.8 to 14.8%. In database software, its position improves from 7 to 7.3%. In minicomputer/workstation networks, Digital's connections rise from 12.7 to 19.3%. And in PC LANs, they go from 4.1 to 5.9%. However, in almost all of these cases, Digital is taking market share away from less-established players—not from the leaders.

The RISC Takers: HP & Sun

Unlike Digital, which seems to be the current target of IBM's AS/400 cannon, Hewlett-Packard has moved out of IBM's range. Fewer than 3% of its customers (including those of Apollo Computer Inc., which HP purchased in April) plan to replace HP systems with AS/400s. The reason appears to be Spectrum, the line of minicomputers based on RISC technology that the Palo Alto computer maker began shipping in August 1987. The machines are capable of running a version of HP's homegrown MPE operating system and/or the company's version of UNIX. The success of the Spectrum line and the ability for HP to supply its customers with PCs seems to be rubbing off on the company's peripherals business. HP leads all others in supplying users in the survey with laser printers and 100+ megabyte hard disk drives.

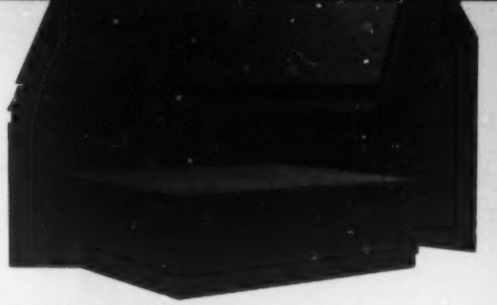
HP, however, faces the same challenge confronting Digital: how to maintain or improve the share of midrange system dollars spent by users with a product line increasingly dominated by lower priced systems—i.e., workstations. Little else can explain why increasing numbers of customers regard HP, like Digital, as their chief supplier of minicomputers and workstations, while those same customers expect to spend fewer of their dollars on future purchases of such systems.

The supplier most responsible for pushing minicomputer and workstation prices lower and lower is, itself, experiencing the same effects as HP and Digital. Sun, too, is gaining customers: 5.6% of users in the survey will consider the Mountain View, Calif. company their chief supplier in the future, up from the 4.1% of all users who worship Sun today. But in terms of dollar-based future purchases of systems, the survey indicates that Sun's market share will drop from 10.7 to 9.6%. The reason again has mostly to do with product lines. Sun has introduced an aggressively priced new family of products, SPARCstations, that's eating into demand for its higher priced workstations.

There are, indeed, clouds for Sun in this year's survey. Loyalty among Sun customers remains below industry average—somewhat of a surprise given the price/performance benefits delivered by the workstation maker. Data General Corp. and Unisys also get lower marks from their customers. Another cloud is Digital, which is the closest runner-up to Sun at customer sites where Sun wins orders. The competition between Sun and Digital should be even tighter now that Digital is offering a RISC product line.

Looking on the bright side for Sun, it seems well positioned in a number of high-growth areas and applications. On the commercial side of IS, for instance, Sun has a growing following. Nearly one out of four Sun users in the survey employs Sun's workstations in office or IS applications—small in comparison with those using its machines for technical applications, but substantial just the same. Sun also gets the highest grades of any supplier for LAN server applications, a key component in the evolving world of distributed processing. Most telling, perhaps, is the fact that customers in the survey buy Sun systems for all of the reasons experts believe will right the worldwide computer industry on its course in the 1990s: processor performance (RISC), networking capabilities and strong UNIX standards.

Sun, of course, isn't alone in building products around such features. Almost all of the traditional minicomputer manufacturers are doing the same. Data General and Unisys, in particular, are empha-


Data General will be squeezed next year as minicomputer sales fall.

PC Software: The Added Dimension

Although personal computers are charging headlong into a new dimension of corporate computing, it's not certain whether software applications can give PCs the push they'll soon need to sustain such momentum. The latest and greatest software products for 80386-based machines are coming to market in agonizingly slow fashion—in part because users see few, if any, new applications for them on the horizon.

Participants in this year's survey of PC, workstation and minicomputer users conducted annually by DATAMATION and Cowen & Co. indicate that the status quo among suppliers will reign in practically all leading categories of desktop applications software. That's especially true in the spreadsheet, word-processing and desktop-publishing worlds.

Today, word processing remains far and away the leading application of PCs. Spreadsheet software and database management systems (DBMSs) packages follow in popularity. Tomorrow, users see DBMS applications as having the greatest potential for fueling the PC industry's growth. But their vision is hardly focused. Only a fourth of users surveyed view DBMSs as the tiger PC users need in their desktop tanks.

Here's the way individual segments look from the survey.

Spreadsheets. Lotus Development Corp.'s dominance is slipping very slightly, as its 1-2-3 product continues to command 70% share of the market. What little ground the Cambridge, Mass., software producer is yielding, Microsoft Corp. seems to be gaining. Its Excel and Multiplan packages give the Redmond, Wash., software maker 14% of the spreadsheet market. Computer Associates Inc.'s SuperCalc and Borland International Inc.'s Quattro products, meanwhile, each continue to capture 4% of spreadsheet use among survey respondents. Note, however, that respondents replied to this year's Mini/Micro survey before Lotus began shipping 1-2-3 releases 2.2 and 3.0 and prior to Borland's Quattro Pro 2.0 upgrade.

Word Processing. WordPerfect Corp. of Orem, Utah, will tighten its stranglehold as the top supplier of word-processing software to users in this year's survey. Nearly half (47%) of all users intend to use WordPerfect for their word processing in the future—up from 30% two years ago. Microsoft will hang onto second place, capturing 14% share with its Microsoft Word product for IBM PCs, PC-compatibles and Macintosh systems. In contrast, WordStar and MultiMate—word-processing packages from MicroPro International Corp. and Ashton-Tate Corp., respectively—fade slightly in importance this year.

Database. Ashton-Tate's real test is in its homegrown market—database management software. Although the Torrance, Calif., company dominates the field with 48% of all users identifying its dBase product as their chief DBMS package, its share is slipping. Gaining ground are Borland International, whose Paradox and Reflex products climb from 6 to 8% in the DBMS category, and Belmont, Calif.-based Oracle Corp., whose share jumps from 3 to 6%. The only steady member of the DBMS fraternity is Microrim, whose R:Base product again captures 7%.

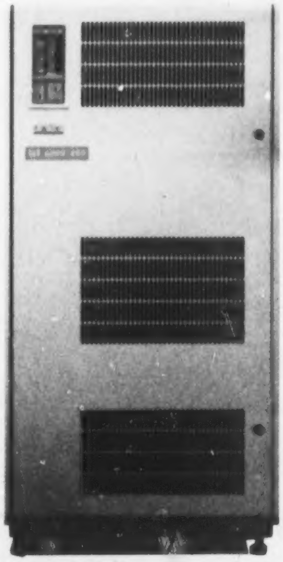
Desktop Publishing. Aldus Corp.'s PageMaker software and Xerox Corp.'s Ventura publishing packages will keep their lock on the market. PageMaker's grip actually will tighten slightly, going from 40 to 42%, while Xerox's will claim 33% of the market for desktop publishing software for the second year in a row. Behind those leaders, Software Publishing Corp.'s PFS:First Publisher's share will be halved to 3% in 1989.

Computer-Aided Design/Engineering. Autodesk Inc.'s AutoCad package wins hands down as the most used computer-aided design/engineering (CAD/CAE) software for PCs, with 61% of respondents saying they will use AutoCad in the future. That's up nearly 10 points from two years ago. No other CAD/CAE product will claim more than a 3% share next year.

Computer-Aided Software Engineering. The tools Oracle is providing with its general purpose database products are having a ripple effect in the PC market for computer-aided software engineering (CASE) products. Oracle's share of this market jumps from 3 to 8% when users identify which CASE product they're now using and what they'll employ in the future. Market leader Index Technology Corp., which produces Excelerator, c cedes some turf to No. 2 KnowledgeWare Inc.

—John McMullen

sizing the performance of their open product lines. Whether the rush to RISC, UNIX and networking standards will shore up the sagging market share of such companies remains to be seen. They, like other traditional minicomputer suppliers Prime Computer Inc. and Wang, are falling further behind leaders IBM, DEC, HP and Sun in this year's survey. More disconcerting for such lagging suppliers is that more minicomputer/workstation users in this year's survey contemplate switching chief suppliers than in the previous four surveys.



DEC recently recharged its Vax 6000 line.

New Styles for New Times

The biggest shift evident among minicomputer users in this year's survey isn't, however, from one supplier to another. It's from one style of computing to another. The traditional proprietary operating systems running on complex instruction set computing architectures are giving way to the open world that AT&T, HP and Sun are making so much noise about. It's an era where users harness the power of RISC technology and the availability of applications software written to a standard (UNIX). And it appears to be an era quickly dawning for users in this year's survey.

One out of five user organizations in the survey intends to make UNIX its primary operating system for commercial applications in the future; two out of five technical users have such intentions. Both figures are up sharply from last year's survey, although users seem hardly more knowledgeable about which version of UNIX they'll bet their IS shops on. Nearly half of all users in this year's survey say they don't know whether UNIX International Inc.'s version of the operating system will win out over the Open Software Foundation's UNIX model. Among the remaining half of survey respondents, however, UNIX International has pulled decidedly ahead of OSF as the odds-on favorite to win the UNIX battle.

RISC, meanwhile, seems to be victorious over complex instruction set computing (CISC) in the contest for systems architectures. Almost a third of all users see reducing the number of instructions needed to make a processor work as the way to go in minicomputers; barely a sixth of them thought so a year ago. And workstation users pledge even greater allegiance to RISC.

What RISC, UNIX and the multitude of other changes afoot in this year's survey imply for IS managers is that the purchasing decisions made today will have a broad impact on their organizations—immediately and down the road. A misstep into the new dimension of desktop computing could be costly. No step into it all, however, could be far more expensive. ▭

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Circle 17 on Reader Card

A Wary Reception To New PC Bus?

Few technical differences separate EISA and Micro Channel computers. But some users are choosing MCA, because it has more add-on boards and peripheral support.

BY BOB FRANCIS

Five years ago, Kaiser Aluminum and Chemical Corp. was a Big Blue shop from the top of its 3081 mainframe to the bottom of its shiny new PCs.

That exclusivity ended when Kaiser's Spokane, Wash.-based information center discovered PC clones. First-generation IBM PC XTs and ATs gave way to 80286-based PCs from companies such as AST Research Inc. of Irvine, Calif., and Dell Computer Corp. of Austin, Texas.

But, with its latest purchases, the company is coming full circle. After several years of relying on clone makers for its PCs, Kaiser is returning to the IBM fold.

One reason IBM is back in good standing at Kaiser is the Micro Channel Architecture (MCA). "We've purchased 16 IBM [PS/2] model 70s, and we're looking at these as the next platform for our implementation of future PC technology," says Norris Brown, Kaiser's workstation manager. Kaiser considers the PS/2's 32-bit input/output MCA bus to be a key element of its desktop future. The speed and advanced technology of the bus—which delivers 32-bit chunks of data to the central processor where previous buses could only transfer data in 16-bit chunks— is also delivering PC clone users to IBM like so many prodigal sons.

"I think IBM did [its] homework," says Brown. The PS/2 and its MCA bus are being received so well that Brown sees their place assured in his company's computing future. "At some point, we'll move to OS/2, and then we'll need to take advantage of the 32-bit capabilities of these machines," he comments.

That's bad news for MCA rival EISA—the Extended Industry Standard Architecture. This rival 32-bit input/output bus is soon to be available in computers from Compaq Computer Corp. of Houston and a consortium of eight other PC makers. The arrival of the EISA bus could be just in the nick of time. According to the 1989 fall DATAMATION/Cowen & Co. survey of U.S. DATAMATION readers' PC purchasing intentions, nearly twice as many PC buyers chose MCA over EISA when asked to name the PC bus architecture likely to prevail in the future. However, there is still a large undecided group, which may give EISA a chance to prove itself. Furthermore, there is still strong support for the AT bus—the 16-bit bus associated with the prior generation PC ATs and compatibles.

EISA was conceived as a result of IBM's decision to change buses with its PS/2 family, replacing the AT bus with a new bus, the MCA. Both IBM and the makers of the AT-compatible machines used the AT buses. However, the MCA bus does not allow PC AT add-in products to be used on the PS/2, making the PS/2s incompatible with the earlier generation PCs. Furthermore, unacceptably high MCA license fees prompted PC clone makers to break with IBM over the new bus and begin work on their own 32-bit bus, EISA, which would be AT- compatible.

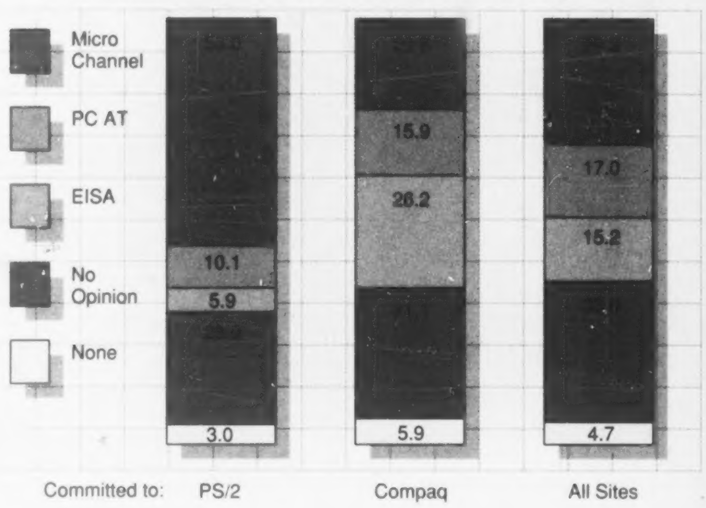
As most indications show, the break has been something of a tempest in a teapot. The majority of existing PC applications haven't required either bus. And EISA systems have been unavailable for direct comparisons. As a result, most of the industry's attention has been on the vendors' split.

But the debate may soon

SETTING THE MOLD: Kaiser Aluminum & Chemical is turning to the MCA PS/2 model 70 for its future desktop systems.

EISA Remains in the Running

Strong support for the AT bus and a large undecided population cloud the outlook for PC bus dominance. Overall, EISA preference trails that of Micro Channel and AT.



Source: DATAMATION/Cowen & Co. 1989 Survey.

take on greater import. As PCs become connected via local area networks (LANs), 32-bit data paths and fast transfer rates become more necessary for the smooth operation of the PC LANs, says Chris Skeadas, senior vice president for communications at the Bank of America (BoA), headquartered in San Francisco.

Two Peas in a Pod

Functionally, the two buses are nearly identical. Both deliver data from memory or peripherals to the processor along a 32-bit data path and support data transfer speeds that are much faster than was possible in earlier PCs. Both also support bus masters, ways of distributing work among specialized processors. Bus masters improve overall system performance by handling jobs that otherwise would occupy the main processor. For instance, specific applications may be assigned to bus masters on a network server, freeing up the main processor for communications tasks.

So far, few such specialized processors actually exist, and even fewer applications can take advantage of those that do exist. Yet, many believe the development of PC-based corporate systems predicated on such technologies as multitasking, micro-to-mainframe links, graphics-intensive video or digitized voice capabilities will eventually create a need for bus masters.

But which 32-bit bus users choose when EISA becomes available may rest more on their willingness to depart from AT bus compatibility than on any technical characteristics of MCA or EISA. "[The differences] are going to be something we take into consideration, but with very important applications you're going to do it [move to a 32-bit bus anyway] whether it is a MCA machine or something else," BoA's Skeadas says. Whether to move to the potent 32-bit architectures of IBM's MCA and EISA is a "no brainer," agrees Mark Cuban, president of MicroSolutions Inc., a Dallas personal computer reseller.

☐ THE SPEED OF THE BUS IS DELIVERING CLONE USERS TO IBM LIKE SO MANY PRODIGAL SONS.

"When you see an MCA machine operating in a stand-alone environment, it's not that different from an AT machine, but in a network application it [having a 32-bit bus] makes a big, big difference," says Cuban. "I imagine an EISA machine will offer the same advantages [as the MCA machines]," he says.

"We had to go to a 32-bit architecture, there's no doubt about that," confirms James Hoisington, a Dallas area computer consultant. "The question is which system will corporations buy into, MCA or EISA?"

The Score on MCA

So far, IBM's MCA has enjoyed a 29-month solo run. And the results speak glowingly for it, according to Dataquest Inc., a San Jose market research firm. IBM will have an installed base of 2 million MCA machines by the end of this year. And IBM has compiled a list of some 1,000 add-in boards for MCA systems that are either currently available or will be shortly.

EISA advocates do not quarrel with these numbers, but they do question their importance. They consider the number of add-in boards a moot point. "Most of those [boards] do not take advantage of the 32-bit operating system, [and] are simply MCA versions of AT add-in cards," says Kevin Mankim, director of product development at EISA supporter Zenith Data Systems Corp.

EISA supporters hope to blunt MCA's 29-month lead by making EISA specifications available earlier than EISA chips, reducing the time for third-party manufacturers to deliver add-in-cards. In addition, several members of the EISA consortium will be likely to offer some EISA peripherals to smooth its market entry. For instance, Compaq is committed to making a 32-bit hard disk controller available with its first EISA system. And Zenith and Hewlett-Packard Co. hint that they are willing to do the same.

Some users, like Brian Livingston, data center manager for Reliance National Insurance Co. in New York City, don't think microcomputer managers should have to deny themselves the choice of different machines and different technologies. As executive director of the 486 Standardization Committee, Livingston wants corporate PC purchasers to have a choice. With standards, one can have a choice without being penalized for their decisions, he argues. "We [microcomputer managers] are all out examining the next platforms we need for the next generation of computing, and we want to have a choice and we want standards. We think we should be able to have both," he says.

Picking What's Available Today

Other users, such as those at Kaiser Aluminum and the Bank of America, are picking what's available today. And that means MCA. BoA recently based a new customer on-line information system on the MCA PS/2 model 55SX. "We needed a foundation for growth because we know new technologies will be coming in the future, and we know we'll need a power PC with 32-bit operating capability," says Skeadas. "From our perspective, the business applications of the PS/2 product line made sense to provide that foundation, and MCA was a part of that," he explains. MCA lends itself to the bank's plans to eventually add advanced technologies such as image processing to its PC network.

At Kaiser, Brown says he expects the MCA PS/2 model 70 to meet his company's future needs, but he plans to keep his options open. "They've built a good machine, but they're going to have to earn their keep. I'm sure there'll be alternatives in the future if they don't measure up," he says.

It's that willingness to consider alternatives that keeps hopes for EISA alive. EISA offers choices in product and vendor selection, says Francisco Albuquerque, PC product marketing director at AT&T in Bridgewater, N.J. "Users want a choice of vendors; they've made that clear," Albuquerque states. Although AT&T is not a member of the EISA consortium, it has endorsed EISA.

The telecommunications giant, which currently sells AT-compatible PCs manufactured by Olivetti and Intel Corp., also will supply MCA-compatible machines if demand appears. "We've stated that we believe EISA is the way to go for 32-bit architectures. At the PC level, buyers have simply not gone with one vendor, and I don't believe you're going to see them move from a multivendor environment to a single-vendor environment when there is simply no real advantage from a technical point of view. The choice, though, is up to the customer," says Albuquerque.

However, a choice of system vendors is by no means an exclusive feature of EISA. Vendors currently supporting or promising MCA systems include Dell, NCR Corp., Olivetti, Tandy Corp. and Wang Laboratories Inc. IBM is another vendor expected to make MCA part of its newest PC family of workstations based on reduced instruction set computing (RISC) technology.

☐ **WE WANT TO HAVE A CHOICE, AND WE WANT STANDARDS. WE THINK WE SHOULD HAVE BOTH.**

Yet, significant sales of MCA technology so far have been limited to IBM's PS/2 family. For instance, Fort Worth, Texas-based Tandy says interest in its 80386 MCA-compatible PCs has been lax.

"We just haven't seen the interest we thought we would [be seeing] if people were really interested in the Micro Channel," says Tandy director of market planning Edward Juge. Tandy will continue to sell the machine even though the company is one of the original EISA founders and plans to sell EISA PCs as well.

Dell, which announced an MCA-compatible machine in April 1988 but has yet to ship any, is another vendor that sees no demand for alternate MCA machines. "The interest simply wasn't there. If there is, we'll ship it, but right now we don't see it," says a Dell spokesman.

Retailers Impartial

That lack of interest was one reason Tandy was more than happy to join the consortium supporting EISA. The eight original members of the consortium are: AST, Compaq, Epson America Inc., Hewlett-Packard, NEC Information System Inc., Olivetti, Wyse Technology and Zenith Data Systems. Since that time almost 200 vendors have expressed interest in producing EISA related products.

Caught in the middle of these factions are the retailers and resellers who supply most of the corporate world with PCs. Pleasanton, Calif.-based ComputerLand Corp. makes information about both 32-bit bus architectures available to its customers. "For the moment, Micro Channel machines are our biggest sellers, but we're constantly being asked to help our customers decide whether they need a better bus," says director of product marketing, William Graves. "So when EISA-based machines are available, we'll be helping them make that choice" by selling PCs of either stripe.

Businessland Inc.'s vice president of national accounts Frederick Snow says that MCA and EISA interest prompted the retailer to train its sales force to handle questions on each. "We don't make the decision for our customers, but we have to offer them a fair evaluation of the technological choices available, even if the technology is not represented by the vendors we represent," he says.

Yet, for all the squabbling today, MCA versus EISA may not be a lasting issue except in IS history books. Says consultant Hoisington: "I remember when we had a raging debate about whether to have square holes or round holes in the old punch card machines. Who talks about that now?"

A Striking Similarity

Wondering about the technical differences between Micro Channel Architecture and Extended Industry Standard Architecture? There are surprisingly few of them.

MCA and EISA support equivalent bus masters features, high-speed data transfers and impressive numbers of card slots. All are important to distributed-processing or cooperative-processing environments, says ComputerLand Corp. director of product marketing William Graves.

It's no wonder, then, that the similarities between these bus architectures are more striking than their differences. Both buses support a maximum of 15 bus masters. These are specialized processor cards that improve overall performance by taking on tasks that otherwise would be performed by the main processor.

At present, there are fewer than 20 bus master boards available for MCA machines. So far, there is only one bus master promised for EISA, although the EISA consortium includes a smattering of board makers. Proteon Inc. in Westborough, Mass., pledges to have a token ring adapter board for EISA bus systems when the systems are shipped later this year.

The differences in other areas are also minor. EISA and MCA both transfer data in so-called burst mode. That means some data can bypass the central processor and move from random access memory to 32-bit peripherals and vice versa at speeds much faster than today's AT computers operate at. EISA specifies a whopping 33 megabits per second and MCA a 20Mbps transfer speed.

Finally a difference between the two systems, you say? Hold that thought while it still feels good. "Users won't be able to tell the difference between machines with a 20Mbps transfer rate and a 33Mbps transfer rate," says Tandy director of market planning Edward Juge.

Another difference between the two standards is the number of slots available for add-in boards. MCA offers eight, EISA 16. A tangible difference? Not hardly. Both are ample for today's needs and probably for some time to come, since so many communications ports are built into all types of PCs, says EISA supporter Bob Puette, general manager of Hewlett-Packard Co.'s Personal Computer Group. Puette says future applications could require several bus master boards, but admits IBM could adapt MCA to allow for more slots.

But, with an ample drum roll, comes a difference that users can have now—a difference that users now can get with MCA and with EISA once the machines are released—self configuring add-in boards. Yes, that's right: neither dip switches nor jumpers would be set, as with existing boards. That difference won't exactly set the world of corporate computing free to solve other more pressing problems, but at least it's something you can count on.

How Are Your Vendors Doing?

S vendors are finding that they are not immune from the general economic slowdown. However, their fortunes are expected to rise with the general economy as well, in 1991.

BY MADELINE FRANCHI

Information systems vendors got a strong taste of the general economic slowdown in the United States this past summer. In particular, U.S. computer and peripherals manufacturers watched their new orders drop like rocks as domestic demand for their products continued to weaken and international sales growth softened, too.

With the 12 months ending in July 1989, new orders for information systems (which include all computers, office equipment and commercial communications equipment) totaled $108.3 billion. Although this represents a 4.5% increase from the prior 12-month period, it compares poorly with the 9% rise enjoyed in the previous year. Furthermore, the bookings for new orders in July 1989, at $9.1 billion, were 3% lower than they were in July 1988. Such a steep year-to-year decline hasn't been seen since February 1987.

The computer and office equipment manufacturers really took it on the chin. New orders for their equipment sagged 3.2% from June to July and a whopping 8.2% from July of last year. Shipments, which had been relatively strong despite waning growth in new orders over the last year, were curtailed sharply, too. From June to July, shipments fell 7%, a decline of 0.3% from July 1988.

The computer industry could get into a real bind if the economic contraction in the general U.S. economy goes deeper or runs longer than is currently expected. According to U.S. Commerce Department data, billings for orders already shipped have been outpacing bookings for new orders for the industry as a whole since 1984. That means backlogs, those orders waiting to be filled, have been dwindling.

As of the end of July, unfilled orders for the computer industry amounted to $11.8 billion. That value is the lowest since April 1978 and represents only two times the amount of monthly shipments at their current level. Other electronic equipment sectors, for example, instruments and communications equipment, have backlogs of around three times their monthly shipments' volume. So, the computer manufacturers' backlogs are low not only by historical standards but also relative to other segments of the electronics industry.

This situation means the computer and office equipment makers don't enjoy a large buffer of orders to help keep production humming as they wait for growth in new orders. So, in the near term, we could see more headlines citing industry hiring freezes and layoffs. As of July, employment in the computer sector averaged 477.9 thousand persons, just about the same as last year at that time, but down almost 7% since 1984.

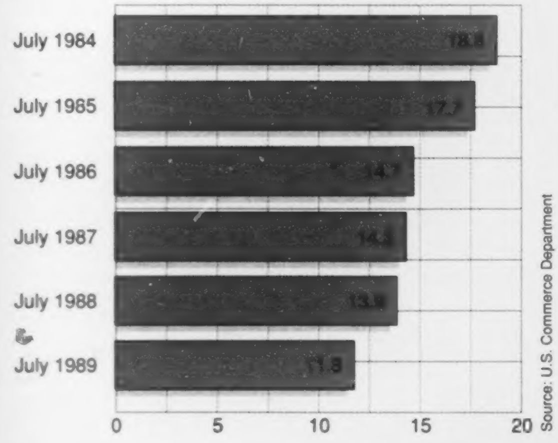
What do the next 18 months look like for U.S. information systems companies? Cahners Economics expects shipments of IS equipment to total $112.3 billion by the end of this year—a 4.7% gain from 1988. Growth in shipments is expected to slow to only 1.4% by the end of 1990 before picking up considerable steam again as the general economy improves and business investment picks up in 1991.

More economic information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617)-964-3030.

Shrinking Computer Demand...

The number of unfilled orders has been on a steady decline since 1984.

Value of Unfilled Orders ($ billions)

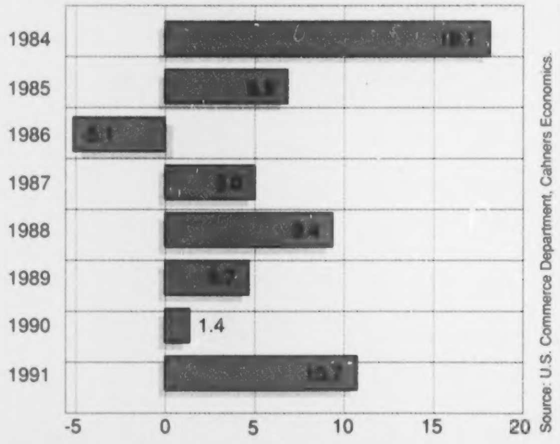


Source: U.S. Commerce Department

Results in Shrinking IS Shipments

A worsening business climate in 1990 is expected to result in fewer shipments of computer equipment.

Annual % Change in the Value of Shipments



Source: U.S. Commerce Department, Cahners Economics.

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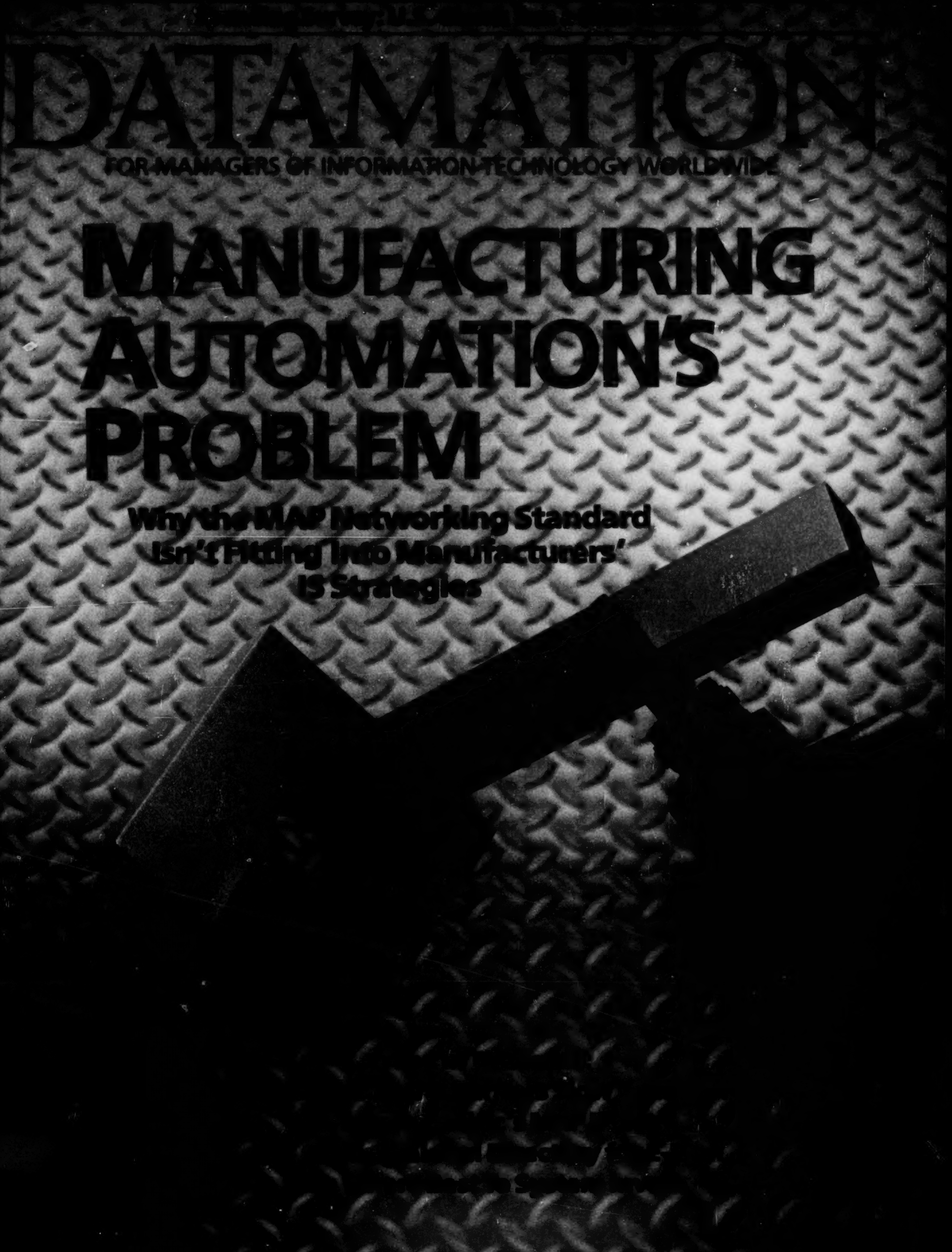

MANUFACTURING AUTOMATION'S PROBLEM

Why the MAP Networking Standard Isn't Fitting Into Manufacturers' IS Strategies

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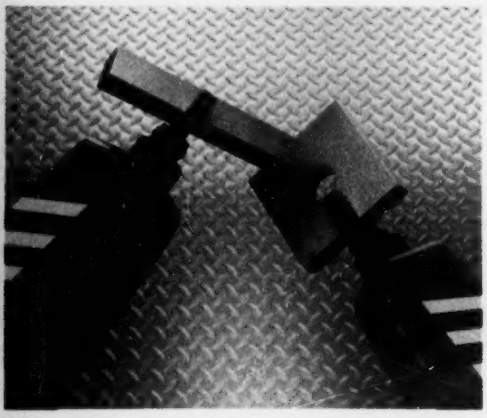

Manufacturing Automation's Problem 32

BY PARKER HODGES When it first came on the scene some seven years ago, the Manufacturing Automation Protocol was a powerful symbol of user influence on industry standards. But, today, the world's first user-developed networking standard for factory automation has attracted only a meager following, despite backing from powerful General Motors Corp.

Cover Photography by David Bradley

DEPARTMENTS

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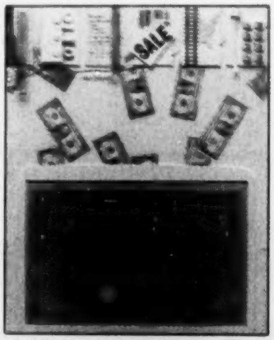

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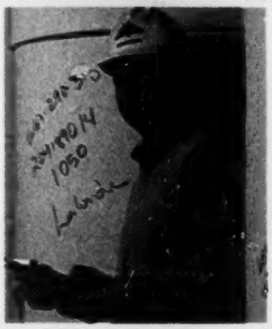

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U.S. Giants Run a $50 Billion IS Tab 42

BY DWIGHT DAVIS Despite a slowdown in the U.S. economy, the industrial and commercial giants in a dozen fields are continuing to invest in information systems and resources at a pace that matches the overall growth of their businesses. Collectively, these 120 industry leaders are increasing their IS investments by 10.5% this year.

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BY JEFF MOAD For most software development organizations, systematic reuse of code and software designs has been an elusive goal. But this state of affairs may change as object-oriented programming systems take hold with vendors and spur fundamental changes in the way software is developed.

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BY CHRIS SIVULA A wood products giant describes the trials, tribulations and successes involved in converting one of its manufacturing plants from a paper-based system to a distributed manufacturing resource planning system.

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The Coming Global Directory for E-Mail 105

BY SUSAN KERR Standards are making it easy to connect electronic mail systems. But locating people on all those systems is becoming a problem. A newly approved international standard may soon make available a worldwide e-mail address book. However, mail network providers say needed technical and tariff agreements may stall widespread use until the mid-1990s.

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OFFICE AUTOMATION

Where Best To System Invest 111

BY BARRY FLOYD AND BOAZ RONEN Introducing automation into an office won't necessarily increase productivity. But, certain techniques now employed to analyze shop floor performance can be used to maximize office automation investments.

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INSIDE DATAMATION

MAP: A Faded, Yet Durable, Symbol

When the idea for a Manufacturing Automation Protocol (MAP) was first advanced by General Motors Corp. and others, it was greeted enthusiastically by manufacturing companies. MAP's warm reception showed, it was believed at the time, that American industry was indeed serious about competitiveness. MAP, which offers a standard way for elements of the manufacturing process to communicate, became a symbol of progressive thinking about the related needs of information systems and business.

But now the applause that greeted MAP has faded, and manufacturing companies have turned their attention to other standards and protocols. As New York bureau manager Parker Hodges reports in this issue's cover story, "Manufacturing Automation's Problem," page 32, "Seven years after its birth, the network standard that promised interoperable and interchangeable systems on the factory floor can't seem to get anywhere . . . . Inconsistencies between initial and current specifications, scant products and a lack of upper management support have idled this network technology even as other vendor-independent network standards zoom along."

Photograph by David Bradley

HODGES: Getting a fix on manufacturing

The problems that developed during MAP's brief time in the sun may warrant relegating it to the place where all good, but unworkable, ideas go. But the laudable motive behind the effort remains. The manufacturing industry is clearly determined to improve its processes, get its information systems house in order and compete effectively. Issues such as time to market, quality and cost reduction are real and won't fade away. Other standards and protocols may succeed where MAP has failed.

So while MAP may someday become a footnote in information systems history, it will remain an important symbol of rational thought in the decade that is about to close.

A View of Another Manufacturing Trend

Distributed processing is an IS trend that is sweeping through manufacturing, as well as other industries. The benefits of organizing IS resources this way are many, but so are the hurdles that must be overcome. As New England bureau manager Chris Sivula reports in "Georgia-Pacific's MRP II Test," the big textile manufacturer went through many trials and tribulations to implement an MRP II system at its tissue paper plant in Bellingham, Wash. To find out how Georgia-Pacific's effort to achieve more efficient production is progressing, turn to page 95.

And for detailed information about how much manufacturing companies—as well as top firms in 11 other industries—are spending on IS, check out our annual industry-by-industry spending survey, appearing on page 42. Overall, the top 10 companies in the 12 sectors surveyed will spend an estimated $51.5 billion this year on IS, up 10.5% from 1988.

David R. Brousell, Executive Editor

DATAMATION

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Manufacturing Automation's Problem

The world's first user-developed networking standard, the Manufacturing Automation Protocol, has attracted only a meager following. Has MAP become a victim of the standards movement?

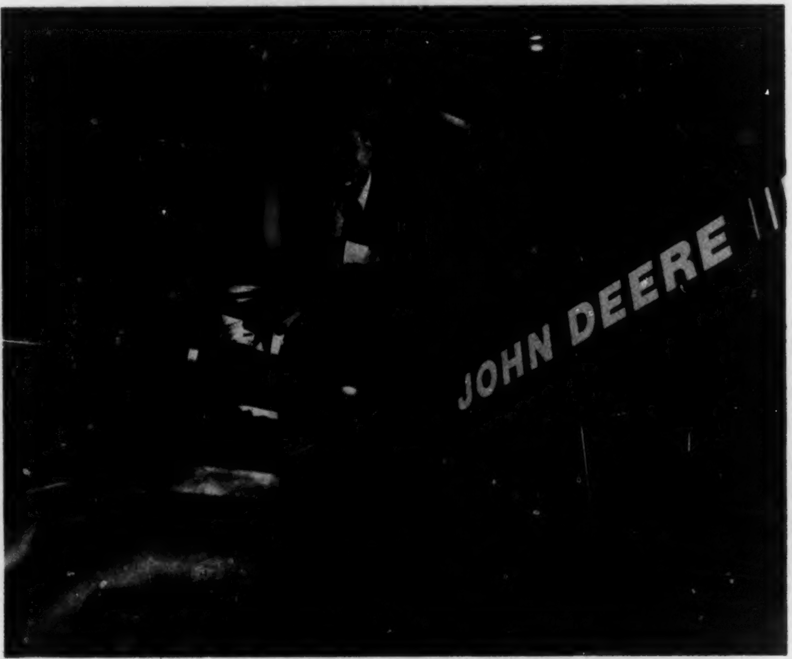
BY PARKER HODGES

Manufacturing Automation Protocol (MAP), a powerful symbol of user influence on industry standards and a once shining example of vendor-independent computer networking standards, has stalled.

Seven years after its birth, the network standard that promised interoperable and interchangeable systems on the factory floor, can't seem to get anywhere, despite the backing of one of the world's most formidable companies, General Motors Corp. Inconsistencies between initial and current specifications, scant products and a lack of upper management support have idled this network technology even as other vendor-independent network standards zoom along.

MAP's lofty ambition of connecting dissimilar machines on a single network once promised to galvanize manufacturing IS executives into purging their present hodgepodge of proprietary factory networks. Such networks are governors on the engines of industry, inhibiting different makes of equipment from sharing data. In contrast, MAP offers a common communications protocol for factory computers, robots and programmable controllers (the intelligent guides for machine tools and robots) in an industry standard network topology.

Where seven years ago MAP alone promised this vendor independence, networks supporting non-MAP Open Systems Interconnection (OSI) protocols are now available elsewhere and seem poised to bypass MAP. For instance, Digital Equipment Corp. next year will deliver OSI compliance as part of its DECnet protocol. Already some early MAP users and vendors have delayed implementations or abandoned the protocol altogether. For example, Seattle-based Boeing Co., an early MAP supporter, recently bypassed MAP for a proprietary protocol in a new factory network. Even staunch believers in the General Motors inspired



DEERE'S GARY BLUNCK: MAP installations suffer from product scarcity.

Photograph by Marc Berlow

> **Other countries** are recognizing the value of MAP, while the U.S. twiddles its thumbs.

protocol say its future may no longer be in their hands.

For instance, two years ago, General Dynamics Corp. of St. Louis began testing MAP 2.1, which is the first version of the protocol to have products supporting it. But now a new version, 3.0, has replaced 2.1, hindering further use at General Dynamics and other companies. "[MAP] 3.0 is still the goal, but until 3.0 has been implemented [in products], I'd be reluctant to recommend this as our strategy," says MAP project manager Mitch Baloga. In the meantime, implemention of other factory networks continues. "Business has got to go on," says Baloga.

That's also the situation at farm equipment maker Deere & Co. of Moline, Ill. A MAP user with more than 100 MAP nodes, Deere recently installed a non-MAP shop floor labor-reporting system because virtual terminal support on MAP wasn't available. "We just did not have the assurance those products would be available soon enough to do the installation," says Deere technical services project manager Gary Blunck. This lack of product choices will prevent smaller companies from utilizing MAP for another five to 10 years, he says. "Larger companies are going to be more aggressive," he predicts.

And General Motors may be one of them. The auto giant will spend about $10 million on MAP 3.0 products each year for the next two years, according to Mike Kaminski, MAP manager at General Motors. West German programmable controller kingpin Siemens AG also has pledged full backing for MAP 3.0. But so far the GMs and Siemens of the world haven't sufficiently convinced many other manufacturers to push MAP along.

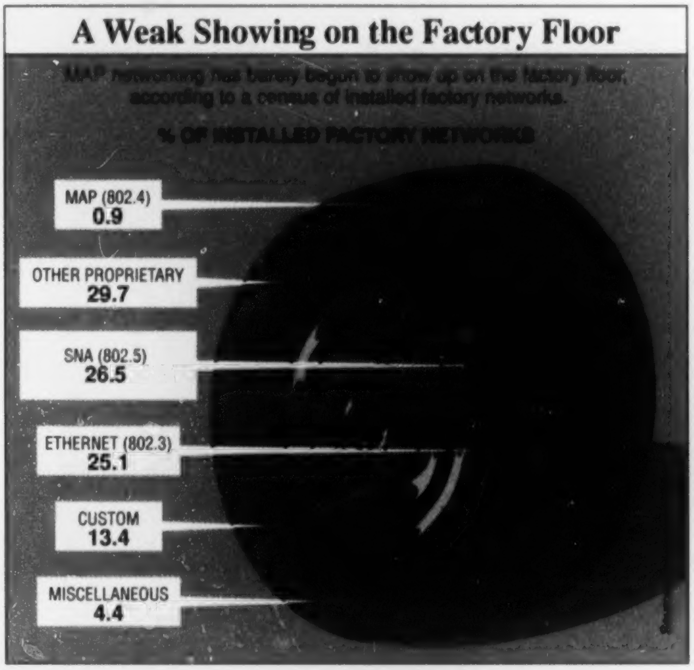
Putting MAP on the Map

To raise MAP awareness and recruit other large companies, the North American MAP Users Group last year formed the Information Technology Requirements Council (ITRC). In part, ITRC was organized to attract executives from the ranks of the top manufacturing corporations. So far, it has been unable to land even a single chief executive officer.

In the United States, "the industry isn't buying," concedes Paul Eastman, chairman of the Institute of Electrical and Electronics Engineers Inc.'s (IEEE) 802.3 token bus standards committee and marketing manager for broadband and local area networks at Fairchild Data Systems. "Investment is not being made by U.S. vendors," says Eastman.

GM's Kaminski describes the current U.S. outlook for MAP more in sorrow than in anger. "We invented the technology," he says, speaking for U.S. manufacturers in general. "We did it because we wanted to become more competitive. And if we don't watch ourselves, it's going to turn around and bite us. Other countries around the world recognize the value of [MAP], are using it, while we twiddle our thumbs."

There is anecdotal evidence to support his contention. "A profile of the [potential] MAP customers we are talking to shows about 60% of the activity is in Europe," says Brice Clark, network solutions manager at Hewlett-Packard Co. "The real hot-bed is in Germany." Clark adds that the remaining 40% is split fairly evenly between users in the United States and the Asia/Pacific area. Lee Reed, research engineer at the Industrial Technology Institute (ITI) in Ann Arbor, Mich., confirms the MAP interest from abroad: "We're getting a lot of requests for technical data from Europe and Japan," Reed says. "MAP makes a lot of sense for Europe. The coming of 1992 [when trade restrictions are dropped among the 12 member nations of the European Community] will require this kind of integration compatibility."


A Weak Showing on the Factory Floor

MAP networking has barely begun to show up on the factory floor, according to a census of installed factory networks.

Yet, MAP's role outside the United States may simply be a twist on the "grass-is-greener-on-the-other-side-of-the-fence" school of thought. "The perception that there is a lot going on in Europe in terms of actual implementation is just not correct," says Susan McGarry, the London-based managing director of Yankee Group Europe. "There is a lot of interest, but not a lot of cash over the table," agrees Roy Cadwallader, chairman of the European MAP Users Group. "European industry isn't entirely convinced that GM is right in terms of the benefits of MAP."

Waving the Flag

MAP supporters believe the Japanese are ready to exploit the protocol's potential and advance beyond all others. "Starting next year, Japan will come on like gangbusters, delivering whole MAP compliant systems—whole milling machines, whole robots," Eastman predicts. Not everyone agrees, however. "I've heard that threat," says Stephanie Johnson, chief operating officer of the Boston-based Yankee Group and one-time vice president of international operations. "I don't buy it." After discussions with

Japanese vendors and subsidiaries of U.S. companies, she believes there is not yet a good market for MAP in Japan.

The Japanese can claim one achievement that U.S. and European MAP devotees are still trying to realize: official government support. Japan's Ministry of International Trade and Industry (MITI) endorses a MAP-compliant factory automation intercommunication system (FAIS) as a national common software. "The Japanese see the advantage of MAP as it has been touted all along," says Eastman. "Not that it has a lower cost per node, not that it will do anything other systems won't do." Unlike executives in the United States, Eastman says, the Japanese clearly understand: "[MAP] makes you vendor independent."

CONCORD COMMUNICATIONS' TONY HELIES: His company supplies the bulk of MAP 3.0 modems and just signed an agreement with IBM.

Photograph by Steve Sherman

Even though it is not clear if either Europe or Japan holds a clear MAP lead, flag waving by the MAP Users Group has attracted some government attention in North America. Canada and the United States have recently assigned official representatives to the ITRC. And the U.S. National Institute of Standards and Technology (NIST) is cosponsoring seminars promoting the benefits of standardized technology.

So, some observers believe it is too early to count MAP out in the United States. Julius Dorfman of Cimdata Inc., a computer-integrated manufacturing (CIM) research house in Wellesley, Mass., says, "The [MAP] competition between Europe, U.S. and Japan is still a wide open ball game." Furthermore, some believe that MAP support—no matter where—helps countries such as the United States with sizable manufacturing bases. "If the installation and use of MAP and other OSI-compatible protocols grow, countries with the largest manufacturing bases would benefit proportionally greater," says Charles N. Thurwachter Jr., also an engineer with the ITI.

Still the fact remains that MAP's penetration of the U.S. factory networking market is shallow. Keith Belton of the Yankee Group says that factory networks based on the MAP protocol constitute only 0.9% of the total U.S. factory network base. Proprietary networks, in contrast, make up just shy of 80% of the installed base, with Ethernet (including Digital's DECnet) and IBM's Systems Network Architecture (SNA) networks taking the lion's share.

Eastman suggests that short-sighted, bottom-line-oriented U.S. companies should bear the blame for their reluctance to take up the MAP challenge. But the story is more complicated than simple MBA penny-pinching.

Where MAP Went Off Track

When MAP backers talk about the Enterprise Network Event '88 International, a trade show that took place in Baltimore in June 1988, they call it The Event, and you can almost hear the capital letters. It was to be a launch with bells on and, when the show was planned, users were going to be able to buy virtually everything they needed to put together a MAP 3.0 network for their factories. Well, it didn't go quite that way. Bob Crowder, an industrial consultant whose company, Ship Star Associates Inc. of Newark, Del., specializes in local area networks (LANs) and factory automation, says of the ENE, "People were really pumped up. If ENE had been held later, or products had been available earlier, you'd have a different story."

Although ENE demonstrations were impressive, MAP's then strong momentum was lost in the subsequent dearth of actual products. It wasn't until April 1989, almost a year later, that would-be MAP 3.0 users could buy anything approaching a complete suite of products.

But loss of momentum wasn't just due to that 11-month delay. The first products that met the MAP 2.X specification were shipped in 1986. Only a year later, when larger users were completing their evaluations, did the MAP/TOP Users Group announce that MAP 3.0 would be forthcoming. "MAP was just hitting its stride, when it was announced that 3.0 would be ready in a year. Well, that year turned into 18 months or two years," says A.J. Friscia of Advanced Manufacturing Research Inc in Cambridge, Mass. "The transition was not handled really well by the MAP community," adds Paul Van Dyke, manager of plant operations market development at IBM.

Furthermore, a lack of available products hasn't been the only issue for MAP. Chuck Gardner, manager for standards and supplier management at Eastman Kodak Co. and a member of the MAP/TOP Steering Committee says that, unlike the situation at GM, many industrial corporations' support for MAP has not come from high up the corporate ladder. Gardner says that the users in the MAP/TOP Users Group "weren't carrying any vice presidential stripes.'

"If you asked any of our members about their vice

European industry isn't entirely convinced that GM is right in terms of the benefits of MAP.

presidents, they'd say the VPs have warm, fuzzy feelings [about MAP]. However, if pressed, the [vice presidents] would stutter and stammer and say, 'There's an active group out there, and we believe that what they're doing is to our advantage,' but that might be where it ended," Gardner says. The ITRC's inability in the last year to attract any CEO members suggests that hasn't changed. Whether top executives are interested in such technical issues is debatable. "We do not try and sell MAP per se [to upper management]," says Deere & Co.'s Blunck. At such presentations, Blunck stresses productivity gains and reduced costs, not protocols or standards.

MAP wouldn't be the first IS initiative to be stymied by lack of high-level support. Perhaps an even greater concern is the fact that it has failed to provide one of the keys to advanced networking: version compatibility. MAP 2.X and MAP 3.0 use completely different application layers. The top layer of 2.1 uses the Manufacturing Message Format Standard—or MMFS, pronounced "Memphis." MMFS was a collection of words, says Ralph Mackiewicz, vice president of sales and marketing at Systems Integration Specialists Co. (SISCO) of Warren, Mich. The company makes factory automation systems that work with, among others, DECnet and MAP networks. Unfortunately, "MMFS didn't specify how to put these words together. So you'd have GM's Saginaw [Mich.] plant putting a sentence together that would not run at GM's bus and truck plant," he says. It wasn't until MAP 3.0 introduced an alternate format, Manufacturing Message Standard (MMS), that the problem was remedied, Mackiewicz says.

But the change from MMFS to MMS made migration from MAP 2.1 to MAP 3.0 a challenge for users. Joe Farrugia, now Atlanta branch manager for AGS Management Systems Inc., once worked at GM and its Electronic Data Systems Corp. subsidiary. While at GM, he worked on a MAP network at GM's Hamtramck, Mich., plant where Cadillac Sevilles are made. Farrugia, currently building an industrial automation product, which IBM is introducing at this month's Autofact show in Detroit, says moving from 2.1 to 3.0 "is more a leap than a migration."

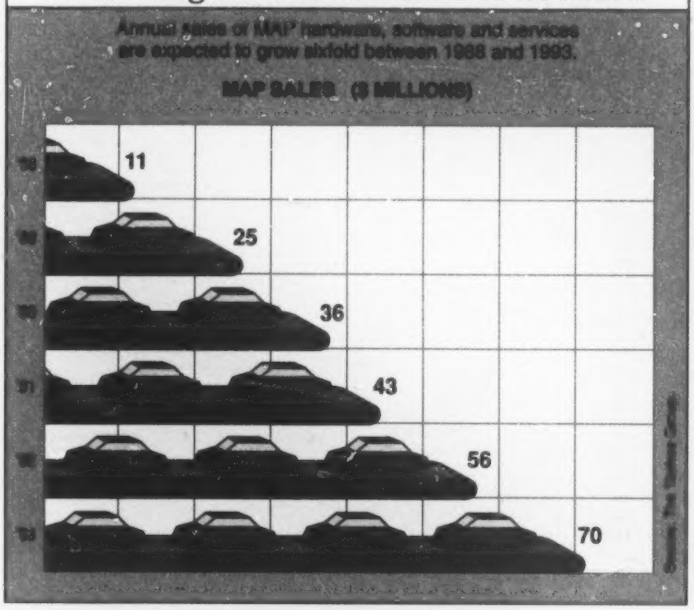
Vendor Migration

For the Aluminum Co. of America, a MAP 2.1 user at its Alcoa, Tenn., plant, the leap became impossible when its principal MAP vendor dropped out of the market. An early user, Alcoa has a 33-node, MAP version 2.1 broadband network that began operation in May 1987. Today, the network is likely to be replaced by a non-MAP network. "We are considering three or four alternatives, including MAP 3.0, Ethernet and proprietary networks," says John Burke, Alcoa's engineering manager of Tennessee operations.

The decision by Alcoa supplier Ungermann-Bass Inc. to leave the MAP arena is "the major reason for Alcoa's consideration of a new network," says Burke. Ungermann-Bass withdrew from the market when it became clear that migration from 2.1 to 3.0 would involve extensive rewriting of its software. Roger Biery, product line manager of protocols at Ungermann-Bass, also says the decision was based on economics: "We'd been in the business for four years and had been unable to turn a profit [on it]."

Other vendors have had similar problems turning a MAP profit. Sales of 3.0 products at Allen-Bradley Co. have been sluggish, says Monte Roach, manager of control network products for the Ann Arbor, Mich., factory equipment supplier.

Estimating the Market for MAP Products



Despite their experiences, SISCO's Mackiewicz discounts the problems involved in changing from MAP 2.1 to MAP 3.0, saying some users will be able to transit to 3.0 without significant pain. "It can be a relatively straightforward migration" involving downloading some software and reconfiguring network addressing, Mackiewicz says. The larger problems appeared for those "who wrote complex applications based on MMFS."

There's yet another problem in layers one and two of the MAP specification, the physical and datalink layers. The MAP specification requires a token bus communications standard. But, according to AGS' Farrugia, "most networks aren't loaded to the levels where tokens would be needed."

GM's Kaminski says the reason for the token bus scheme is potential expansion. "Right now, the number of devices on the plant floor is limited. We would expect that number to grow tremendously, not only with GM but with small companies, as well.

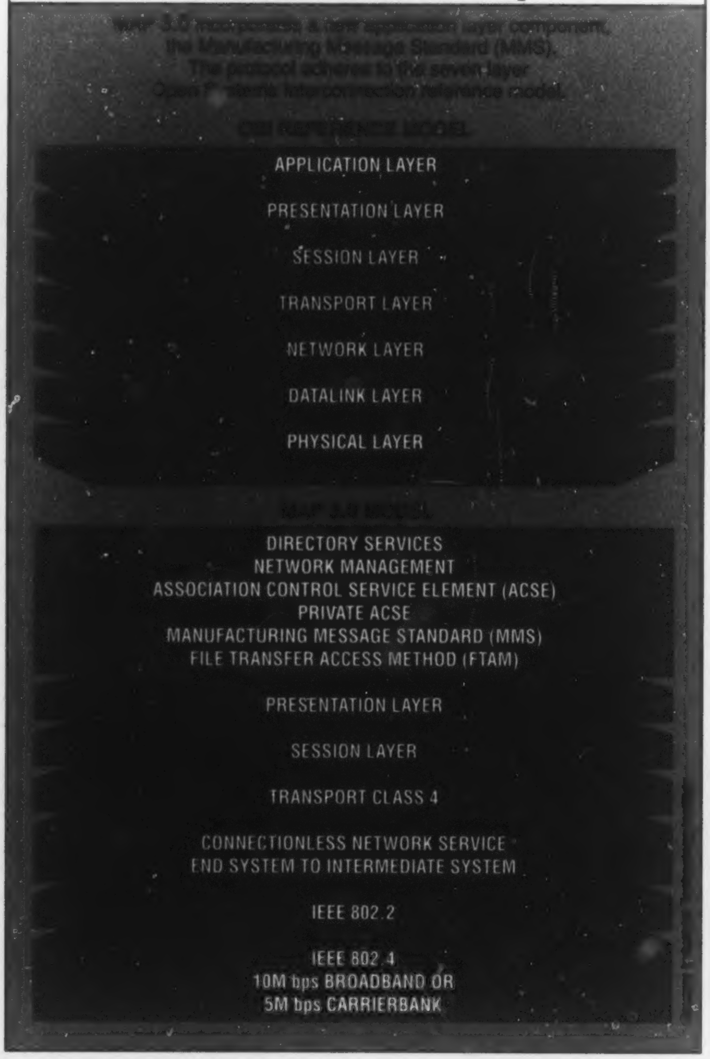
"If I'm going to install 10 nodes today, but expand to 100 in two years, I don't want to pull out an Ethernet network and put in a carrierband network. But, maybe, if I'm only going to put in 10 nodes and leave 10, maybe baseband Ethernet is OK. We're not against 802.3. But, as you expand and grow, we know that MAP allows for expansion. We don't know that Ethernet will."

Despite its capabilities, MAP's penetration of the factory-networking market is shallow.

Digital president Kenneth H. Olsen is one who has been vocal in his insistence that MAP's token bus architecture was unnecessary. Yet, the purchasing power of its customers, particularly General Motors, has led Digital at least partially into the MAP camp. A Digital spokeswoman confirmed that the company is field testing Digital MAP 3.0 products. In early August, GM's Kaminski reported meeting with Digital to settle details of its 3.0 implementation. Digital has an enormous lead in the installed base of factory networks. Advanced Manufacturing Research estimates 1988 sales of DECnet topped $100 million, with some 490,000 DECnet nodes installed.

Ungermann-Bass' Biery says: "The most important thing that MAP offers is OSI [compliance]." And, in addition to token bus, the OSI reference model includes as options at the physical link and datalink levels, token ring and Ethernet. Digital announced in 1987 that its DECnet strategy would be based on evolving the product to OSI compliance by 1990. The scheme will be called DECnet/OSI Phase V.

How MAP 3.0 Stacks Up


MAP 3.0 incorporates a new application layer component, the Manufacturing Message Standard (MMS). The protocol adheres to the seven-layer Open Systems Interconnection reference model.

OSI REFERENCE MODEL
APPLICATION LAYER
PRESENTATION LAYER
SESSION LAYER
TRANSPORT LAYER
NETWORK LAYER
DATALINK LAYER
PHYSICAL LAYER
MAP 3.0 MODEL
DIRECTORY SERVICES
NETWORK MANAGEMENT
ASSOCIATION CONTROL SERVICE ELEMENT (ACSE)
PRIVATE ACSE
MANUFACTURING MESSAGE STANDARD (MMS)
FILE TRANSFER ACCESS METHOD (FTAM)
PRESENTATION LAYER
SESSION LAYER
TRANSPORT CLASS 4
CONNECTIONLESS NETWORK SERVICE
END SYSTEM TO INTERMEDIATE SYSTEM
IEEE 802.2
IEEE 802.4
10M bps BROADBAND OR
5M bps CARRIERBAND

Digital's MAP 3.0 entry may give a boost to MAP 3.0. Ship Star's Crowder says, "Until DEC and IBM have 3.0 products, it won't really happen. If you have a corporate strategy committing to IBM or DEC, you aren't going to commit to MAP until they have products. People who have a major commitment to HP and want to go to MAP are in better shape."

At IBM, Paul Van Dyke says, "We have positioned MAP as part of our overall OSI strategy. MAP 3.0 is IBM's strategic LAN for plant floor networks." And Van Dyke adds that IBM is supporting the newer MAP 3.0 MMS standard at the application level, saying "MMS is a vehicle for applications development." Van Dyke also notes that Big Blue has a MAP network installed at its Endicott plant in Binghamton, N.Y., to help build 9370s. The plant is now also turning out IBM's hit midrange computer, the AS/400.

Will GOSIP Help?

Another potential boost for MAP may come from the federal government. ITI's Reed says that "MAP matches the GOSIP standard." GOSIP, the Government Open Systems Interconnection Profile, is mandated for all U.S. government communications systems installed after August 15, 1990. Kevin Mills, chief of NIST's Systems and Network Architecture Division, notes that "MAP complies with all OSI standards currently existing," adding that, while, "MAP has its own network management standard and its own directory services standard, as yet there are no OSI standards for these functions."

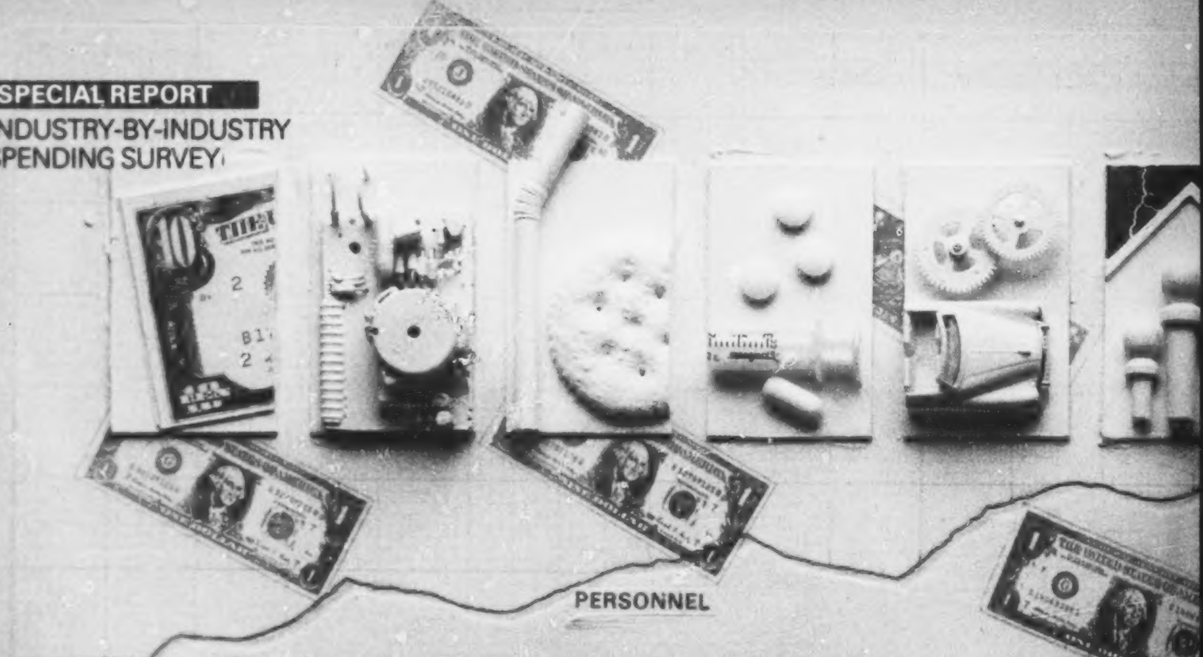
Taken together, these moves may supply what Ship Star's Crowder says MAP now needs, "a recharge." ITI's Reed says he expects shipments of MAP products to grow 20% to 30% over the next few years. However, Friscia of Advanced Manufacturing Research says that MAP 3.0 won't take off for a few years yet: "MAP 3.0 won't begin to take off again until OSI does, in 1993–95, when it becomes clear that the MMS application layer will run on OSI." Still, SISCO's Mackiewicz says MMS is well on its way to becoming an international standard.

For some vendors, MAP 3.0 is already paying off. Tony Helies, president of the privately held Concord Communications Inc. in Marlborough, Mass., whose company makes a full range of MAP-compliant networking products, including diagnostic tools and connections for IBM PC ATs and PS/2s, says, "In our case, it has really taken off this year. Throughout 1989, [Concord's order] bookings have been running 70% over last year." Helies adds: "Every major vendor of automation is in the process of bringing out their 3.0 connections."

For users, however, MAP may eventually wind up being just a symbol, albeit a proud one, of control over their own IS destinies. Other protocols coming under the OSI banner are attracting a wider following and appear ready to subsume MAP as the standard for the factory floor. But when the technological history of the period is written, MAP will be known as the spark that started it all. ▭

SPECIAL REPORT

INDUSTRY-BY-INDUSTRY
SPENDING SURVEY



Despite a slowdown in the U.S. economy, the top companies in a dozen fields of industry and commerce are increasing their IS investment by 10.5%.

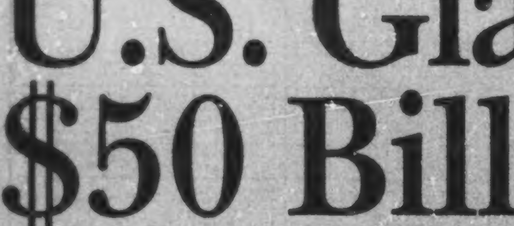
U.S. Giants Run a $50 Billion IS Tab

The industrial and commercial giants of the United States are continuing to invest in information systems and resources at a pace matching the overall growth of their businesses. DATAMATION's annual survey of IS spending by the top 10 corporations in 12 U.S. industry sectors reveals that the top 120 companies will spend an estimated $51.5 billion this year on IS—up 10.5% from the $46.6 billion they allocated in 1988 for personnel, hardware, software and overhead associated with information technology management. Such growth nearly mirrors the rise in revenues for the 110 nonbanking/financial companies in this year's survey, whose fortunes are expected to swell 10% above last year's $1.74 trillion total.

IS spending as a proportion of corporate revenues will remain at the same 2.3% in 1989 as it was in 1988. But leading U.S. companies will not necessarily each spend their IS dollars in the same way. On the one hand, telecommunications, electronics and automotive/industrial businesses are far and away the most IS intensive among the 11 out of 12 sectors whose revenues we measure. Each is spending more than 3% of its annual revenues on computers, communications and the like. Retailers, food and beverage producers, and oil companies, on the other hand, exhibit far less passion for the wonders of microprocessor and software technology. Each allocates barely 1% of its sales on IS.

Banking and finance, the one sector gauged in terms of assets rather than revenues, obviously sees big dividends in information technology. Commercial banks, brokerage firms and other financial institutions are investing in on line transaction processing (OLTP) systems, databases and other IS-based fi-

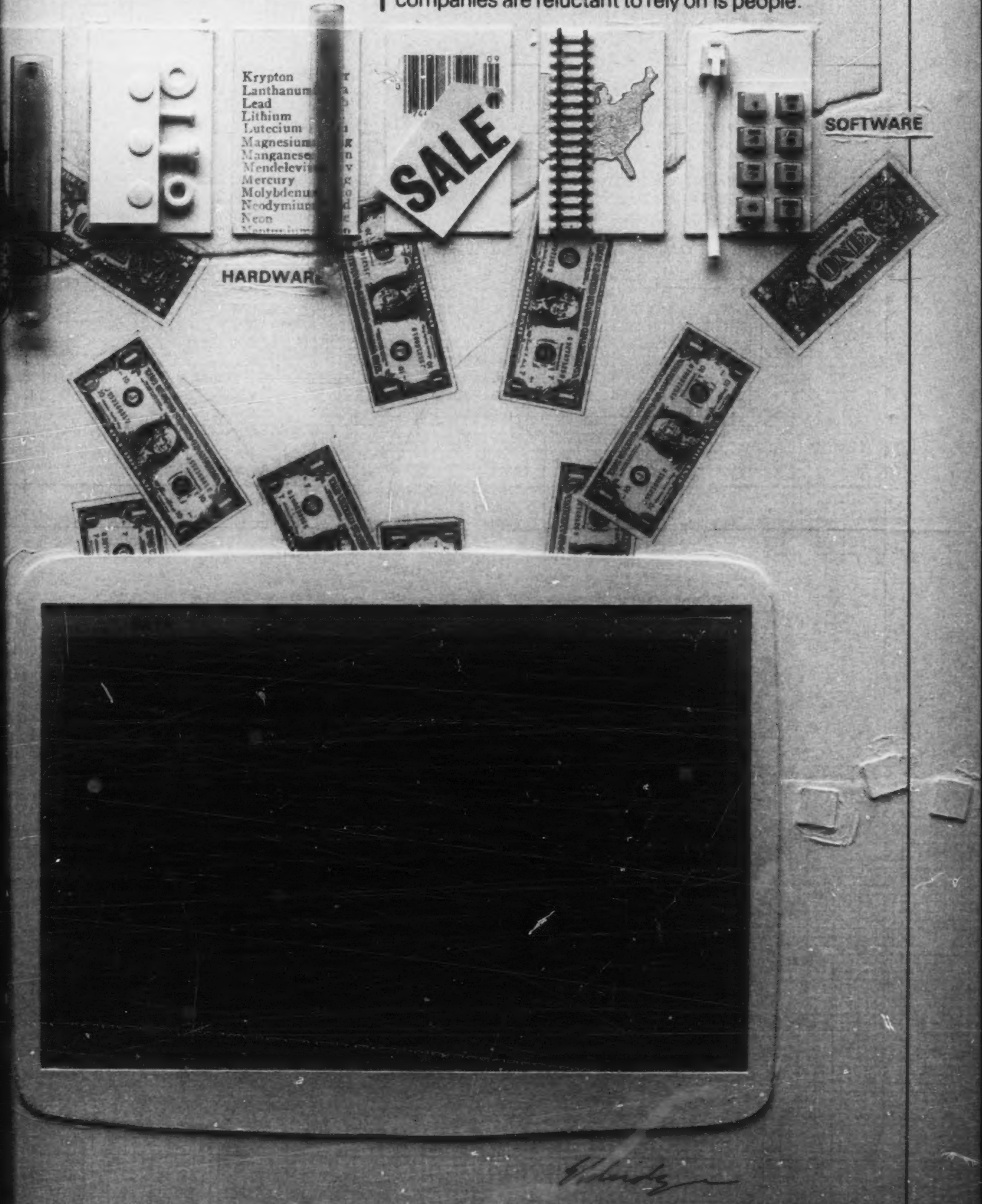
Distribution of IS Funds 1988, Overall Industry Averages



Source: Business Research Group.

BY DWIGHT DAVIS

What top IS executives at several companies are reluctant to rely on is people.


Krypton
Lanthanum
Lead
Lithium
Lutecium
Magnesium
Manganese
Mendelevi
Mercury
Molybdenu
Neodymiu
Neon
SALE
HARDWARE
SOFTWARE
ONE

One trend crosses all industry sectors— the move toward distributed computing.

nancial tools to an incredible degree: the sector's IS investments equal nearly 75% of its profits. American Express Co., Chase Manhattan Bank Corp., Citicorp and Security Pacific Corp.—financial institutions renowned for their IS strategies in the past—show every sign of becoming more IS dependent.

What top IS executives at several companies are reluctant to rely on is people. Several are scrutinizing their personnel outlays, which will consume 44% of IS budgets this year. That's down slightly from 1988, when salaries consumed 45% of all IS allocations—evidence that most executives already have started paring back their ranks or moving them out to support business units.

When such cost-slashing measures succeed, the savings are usually reinvested in some other IS area, causing overall IS budgets to remain relatively constant as a proportion of revenues. Most of these liberated IS funds are going into software, judging from this year's survey. Our survey shows top shops will spend 11% of their IS dollars on applications and systems software in 1989—up a point from 1988. IS allocations for hardware and overhead will remain unchanged from last year, with 34% of IS bucks going for processors, private branch exchanges (PBXs) and other hardware. Overhead IS expenses, like outside services, are also holding steady—eating up only the 11% of budgets in both 1988 and 1989.

Behind the numbers is one trend that crosses all industry sectors—the move toward distributed computing. User organizations in finance, health care and other sectors are channeling increasing amounts of computer power away from headquarters operations toward workers themselves via personal computers, workstations and networks. Because these distributed systems are less expensive than centralized, large-scale computers, they tend to keep hardware spending flat relative to other portions of IS budgets. In reality, however, those hardware dollars are delivering far greater processing power to users than a cursory analysis of this year's survey would suggest.

U.S. Industry's IS Shopping Bill

Firms spent almost $50 billion last year on information technology for everything from finding oil to stocking shelves.

INDUSTRY-BY-INDUSTRY BUDGET SUMMARY, 1988

Industry	IS as % of Rev	IS Budget	Revenue	Profit
Automotive & Industrial	3.2	11,179	349,355	15,550
Banking & Finance	0.6*	6,303	1,050,543*	8,576
Electronics	3.7	7,135	192,834	13,706
Food & Beverage	1.1	1,189	108,088	5,892
Health Care & Pharmaceuticals	2.6	1,570	60,363	6,321
Insurance	1.7	2,545	149,646	6,546
Metal & Metal Products	2.2	1,117	50,785	(290)
Petroleum	1.3	3,670	282,290	17,190
Process Industries	2.1	2,978	141,810	11,197
Retail	0.8	1,583	197,834	4,989
Telecommunications	4.0	5,294	132,361	8,980
Transportation	2.6	1,979	76,113	2,991
Totals	2.3**	46,542***	1,741,479**	101,648

*Assets, rather than revenues, are indicated in the Banking & Finance category.
**Based on revenue and budget totals from all industry sectors other than Banking & Finance.
***Includes the Banking & Finance expenditures
All dollar amounts are in millions

Source: Business Research Group.

Distributed computing makes tallying IS budgets difficult, since some corporations break out divisional or line business IS expenditures separately from central IS spending. Our survey attempts to include the total IS spending—central and distributed.

The survey also endeavors to include telecommunications costs related to IS functions within the 120 corporations.

One facet of communications gaining headway in most major companies is electronic data interchange. EDI, as it's known, allows suppliers and their customers to exchange standard business documents, like purchase orders, directly from computer to computer. A growing portion of IS budgets is being devoted to setting up and maintaining such links.

Other technologies in vogue this year are:

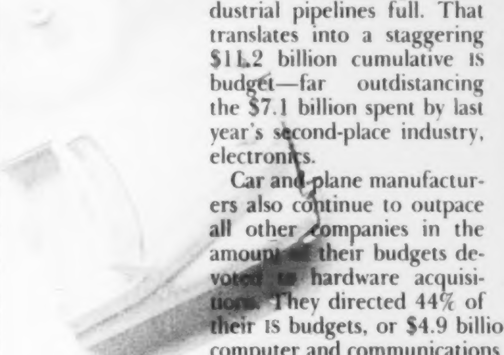
- **Computer-integrated manufacturing.** Every industrial sector from autos to food is trying to increase the productivity of its plants via networked factory systems.
- **Database management software.** Software that can discern patterns in customers' habits and transactions is in demand, as companies find that tracking those trends buried in their own customer records can be turned into profits.
- **Computer-aided software engineering.** IS executives are turning to CASE tools as their chief weapon in the fight against the biggest line item on their budgets—personnel. Helping to automate software development reduces the time and dollars consumed by programmers charged with creating mission-critical applications.
- **Mass storage.** New applications, such as those involving imaging, require far more storage capacity on distributed and centralized computers than previously existed.
- **Distributed computing.** Hardly a sector isn't taking advantage of the power of today's workstations and local area networks.

Leading companies' emphasis on applying new technology and their willingness to underwrite its use bodes well for the future of the IS industry in the United States. If IS spending among the major companies in these 12 sectors continues to grow at its historical pace, the 1990s may be a far more important Information Age than the decade that's about to expire. ▭

Dwight Davis is an associate of the Business Research Group, a subsidiary of Cahners Publishing Co. The Newton, Mass.-based BRG was commissioned by DATAMATION to conduct the magazine's third annual industry-by-industry IS spending survey. Davis collaborated with DATAMATION's writers, bureau managers and editors to produce spending profiles of the 12 sectors surveyed this year.

Many IS products are developed specifically to address the needs of the auto & aerospace companies.

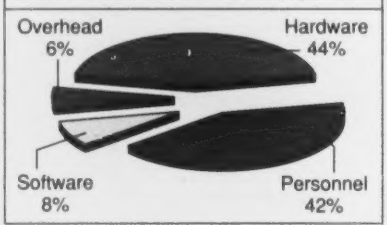
Car and Plane Makers Fuel Up With CAD, AI



Led by impressive sales at the Big Three auto makers and substantial orders for new passenger aircraft, the automotive and industrial sector racked up revenues of $349 billion in 1988, replacing the top 10 petrochemical firms as the No. 1 revenue generator. More important, the sector continued to fuel its growth with information systems—spending 3.2% of its revenues on the technology resources needed to keep car showrooms stocked, jet aircraft flying and other industrial pipelines full. That translates into a staggering $11.2 billion cumulative IS budget—far outdistancing the $7.1 billion spent by last year's second-place industry, electronics.

Car and plane manufacturers also continue to outpace all other companies in the amount of their budgets devoted to hardware acquisitions. They directed 44% of their IS budgets, or $4.9 billion, to the coffers of computer and communications equipment vendors last year. The buying power of car and plane customers is so overwhelming, in fact, that many IS products are developed specifically to address their needs and only later marketed to broader industry segments.

Distribution of IS Funds, 1988



Computer-aided design (CAD), engineering (CAE) and manufacturing (CAM) systems often are christened on the factory floors of General Motors Corp. and Boeing Co. The reasons for this hardware infatuation are apparent when one considers the nature of the sector's businesses. Every aspect of its operations—from design and manufacturing to documentation to employee records—is highly dependent upon automation and communications.

The Top 10 in Autos & Industrials

Car and plane manufacturers outpace all other companies in the amount they spend on hardware.

Company	IS Intensity	Revenue ($ Mil)	Profit ($ Mil)	FY End
General Motors	+	121,085	4,856	12/31
Ford	-	92,446	5,300	12/31
Chrysler	-	35,473	1,050	12/31
United Technologies	+	18,088	659	12/31
Boeing	+	16,962	614	12/31
Tenneco	=	15,707	822	12/31
McDonnell Douglas	+	15,072	350	12/31
Rockwell International	+	11,946	812	9/30
Allied-Signal	-	11,909	463	12/31
Lockheed	=	10,667	624	12/31

Source: Business Research Group

Can IS Help Fight Foreign Competition?

These car makers and aerospace firms are expected to suffer some as the Pentagon's purse strings are drawn tighter. But pressures to scale back the defense budget won't have much of an impact on IS spending for several years, if at all. Rather, to fight off foreign competitors, IS expenditures are expected to remain fairly high on the assembly lines of Detroit and in the hangars of the Northwest, as U.S. producers attempt to match or exceed the efficiencies of their Japanese and European rivals.

As part of that effort, no other sector has invested so much in CAD and CAE. Workstation vendors as well as sellers of high-end graphics engines, minicomputers and even supercomputers have found ready buyers in Motor City, Seattle and elsewhere on the industrial map. Increasingly, product prototyping is done computationally, rather than by building scale models, with sophisticated 3-D graphics packages, computational fluid flow algorithms and other advanced simulation and analysis techniques.

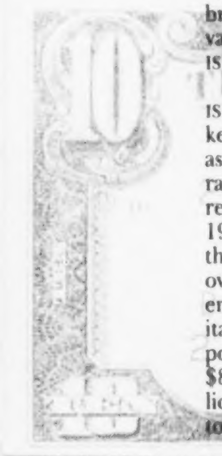
Factory automation remains the most visible of the car manufacturers' computer-based activities. But much of the expense for robotics, numerically controlled machines and other factory-floor systems falls outside the corporate IS budget. Connecting factories with other departments, such as engineering, inventory and the business offices, however, does fall within the IS purview.

Networking, in fact, constitutes a sizable proportion of the IS budget in this sector. The problems associated with designing, prototyping, manufacturing, testing and marketing new cars and planes can best be tackled as a group effort. It is becoming increasingly rare for designers to work in isolation from manufacturing engineers, or for these engineers to function without marketplace feedback. The auto manufacturers are also heavily dependent upon terrestrial and satellite communications links between their plants and thousands of local dealers.

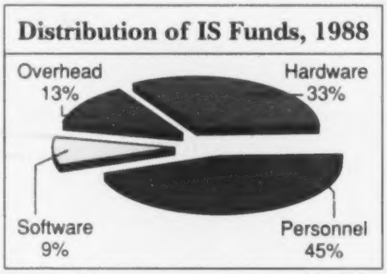
Both the auto and aerospace companies invest heavily in developing their own advanced technologies, including long-standing work in artificial intelligence. In-house development projects using AI techniques continue at the leading companies in this sector, despite the bad press AI vendors have received during the past year as they struggle for viability. Whether as an expert system that helps diagnose a malfunctioning factory tool or as a natural language system that lets users query databases with English-language questions, AI is gradually beginning to produce benefits. ▭

Financial firms are particularly amenable to IS outlays in the area of database management systems.

Finance Firms Invest In Open Systems



Banking and finance sector leaders rely heavily on computer-and communications-based services to distinguish themselves from one another. As in other service industries, spending on intelligent information systems has long been seen as an essential part of this sector's strategic and competitive successes. Data constitute the main commodity for banks and brokerage houses, and this sector has been in the vanguard in pushing for and adopting leading-edge IS technologies.


Distribution of IS Funds, 1988

As in previous surveys, the IS budgets of banks and brokerages have been calculated as a percentage of assets, rather than as a proportion of revenues. By comparison with 1987, during which several of the leading firms and the overall sector showed considerable losses, 1988 was a profitable year. The top 10 firms posted combined profits of $8.6 billion in 1988 on assets of more than $1 trillion Of these assets, 0.6% went to IS budgets, which totaled $6.3 billion.

The financial services sector is particularly amenable to IS outlays in the area of database management systems, transaction-processing software, fault-tolerant systems and telecommunications networks. Of the newer technologies coming down the line, high-speed image processing is attracting interest at such firms as Security Pacific Corp. in Los Angeles, which is ready to sign some big checks for document management systems. The banking and finance sector as a whole stands to realize significant benefits from this technology, which allows paper records to be digitized, stored and electronically transmitted.

The Top 10 in Banking & Finance

Banks and brokerages are spending big on transaction-processing software and telecom networks.

Company	IS Intensity	Assets ($Mil)	Profits ($Mil)	FY End
Citicorp	+	207,666	1,858	12/31
American Express	+	142,704	1,038	12/31
Federal Natl. Mortgage Assn.	-	112,258	507	12/31
Chase Manhattan	+	97,455	1,059	12/31
BankAmerica	+	94,647	726	12/31
Salomon Brothers	=	85,256	280	12/31
J.P. Morgan	-	83,923	1,002	12/31
Aetna Life & Casualty	=	81,415	713	12/31
Security Pacific	+	77,870	639	12/31
Chemical Bank	+	67,349	754	12/31

Source: Business Research Group

Cashing in on Personnel

These companies are innovative in personnel issues, as well as technological ones. They have led the way in establishing the chief information officer (CIO) position or its equivalent. While other industries have debated the need for a corporate-level post to oversee the acquisition and exploitation of IS, the financial services sector has moved rapidly to embrace the concept.

Not everybody in the sector, however, embraces the notion of paying their IS chiefs and staffs the big bucks that Wall Street's IS wizards command. Banks pay their IS employees less than the brokerage and credit card firms, which often lead all other industry sectors in employee compensation. In fact, the banks and brokerage houses tend to cancel one another out in this regard: the overall 45% of IS budgets spent on personnel is identical to the industrywide average.

One of the most difficult and expensive jobs the CIOs at these merger-minded firms must address is the integration of disparate computer and communications systems. In recent years, hundreds of millions of dollars have been spent by all industries on software to link incompatible systems or replace the systems altogether.

The banks and brokerages are thus acutely aware of compatibility issues, and they are attempting to implement corporatewide standards for IS acquisitions.

Aiding this sector and others is the growing trend toward open systems architectures—models for computers, communications and software that conform to accepted industry standards. In the geographically distributed financial services industry, adherence to common protocols, computer platforms and operating systems is critical. "The technologies of the future have to merge the architectures of UNIX, MS/DOS and MVS," says Fran Dramis, managing director of the Business Technology Organization at Salomon Brothers Inc. in New York City.

The reference to the three operating systems suggests just what platforms will be used to build financial systems superarchitectures—workstations, personal computers and mainframes. "We want products to be as vendor nonspecific as possible," Dramis stresses.

As the financial firms gradually succeed in implementing these standards and the cost of overcoming incompatibilities declines, the percentage of assets devoted to IS may actually drop slightly. ▭

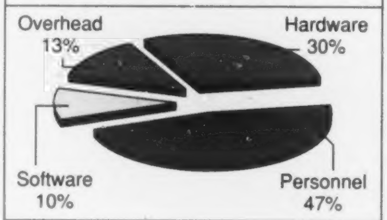
The industry that makes electronic data interchange possible is only now beginning to exploit EDI.

Computer Makers Distribute Their Wares

As in past years, the electronics sector leaders continued to spend well above the industry average on IS in 1988. Computer manufacturers and electronics conglomerates last year devoted 3.7% of their revenues to IS tools and resources. Such IS devotion means that the top 10 electronics companies allocated $7.1 billion of their $192.8 billion in revenues toward systems the would shorten product development cycles, improve manufacturing operations and create new distribution efficiencies—all competitive necessities in the electronics sector.

Electronics giants such as Digital Equipment Corp., Hewlett-Packard Co. and IBM thus continue to be among their own best customers. Purchasing their own products at a discount helped the electronics giants to keep their hardware budgets at 30% of their total IS budgets—well below the 34% average for the survey. Personnel costs (47%) and overhead (13%) were above average in 1988. Software outlays related to their own internal IS operations consumed 10% of systems budgets—equal to the average for all 12 sectors.

Distribution of IS Funds, 1988



This year tells a different story for the IS teams in Armonk, Fairfield County, Silicon Valley and other high-technology hot spots. Although hardware investments for the top 10 electronics firms will continue to fall below average—they'll spend 29% of their IS dollars on computers, while all sectors will devote 34% to them—the sector's spending on IS personnel will jump. Our survey estimates that electronics companies will spend 50 cents on the IS dollar for programmers, business analysts, microcomputer managers and others who work directly with the systems used to run those organizations. That's six points above the industry average. This behavior could be telling for other sectors, implying that the complex information systems now being constructed at computer and other electronics companies—ones that computer vendors are also trying to push on their biggest customers—require a significant investment in human IS skills. They are also investing in computer-aided software engineering (CASE) systems, project management software, and computer-aided design and manufacturing.

The Top 10 in Electronics

Electronics companies will spend 50 cents on the IS dollar for programmers, business analysts and other IS personnel.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
IBM	=	59,681	5,806	12/31
General Electric	-	49,414	3,386	12/31
Xerox	=	16,441	388	12/31
Westinghouse	-	12,500	823	12/31
Digital Equipment	+	11,475	1,306	6/30
Unisys	=	9,902	681	12/31
Hewlett-Packard	+	9,831	816	10/31
Motorola	+	8,250	445	12/31
Raytheon	-	8,192	490	12/31
Honeywell	-	7,148	(435)	12/31

Source: Business Research Group

Ironically, the industry that makes electronic data interchange possible is only now beginning to exploit EDI's benefits. The electronics industry has lagged behind other sectors, such as the automotive and industrial segment, in implementing EDI. But it is now moving aggressively to set up links with suppliers and customers.

Electronics companies can't blame all of their rising communications costs on EDI, however. Distributed computing plays a part, as well. As more companies in the sectors decentralize decision making and other aspects of their businesses, they become more dependent on networks to tie together the distributed processing power that supports such decentralization.

Network Incentives

Whereas an electronics firm 10 years ago might have used one mainframe to design, manufacture and stock a product, today it's more likely to have designers at 10 locations around the world engineer the product on various workstations; have factories at, say, three locations produce it, with the help of midrange systems; and use warehouses in 50 cities to distribute it, with the help of high-end personal computers. What ties all of that equipment together are local- and wide-area networks. If long-distance telephone rates charged by AT&T, MCI Communications Corp. and other carriers hadn't come down during the past few years, the costs of internal and external networking could have taken up a far greater chunk of the electronics firms' IS budgets.

The electronics companies remain among the most highly automated of all U.S. companies. In boom years such as 1988, when the top 10 companies achieved profits approaching $14 billion, the incentive to increase IS budgets was strong. Even in hard times—including the softening in some electronics markets seen this year—these companies have an ingrained tendency to turn to high technology as a solution to their problems. ▭

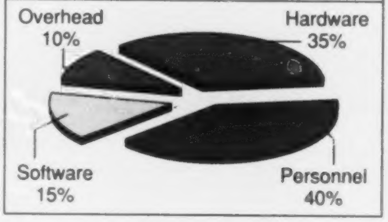
Pursuing flexible manufacturing goals and building extensive networks makes food makers thirsty for software.

Producers Show Less Hearty IS Appetites

Although computer-integrated manufacturing (CIM) and distributed processing are mainstays of the food and beverage industry, the percentage of revenues that the top companies devote to IS is relatively meager. In 1988, IS budgets consumed only 1.1%, or $1.2 billion, of the sector's $108.1 billion in revenues. Only the top 10 retailing companies spent a lower percentage of their sales on information technology.

Food and beverage producers spend less of their IS budgets on personnel than any other industry group—40% in 1988, which is expected to drop to 38% in 1989. In contrast, their software expenditures are the highest percentage of any sector—consuming 15 to 16% of their IS investments.

Distribution of IS Funds, 1988



What makes the sector so thirsty for software? Its pursuit of flexible manufacturing and its extensive distribution and retailing networks. Quality control of vegetables, soft drinks and other goods processed or made by sector companies is such a crucial component of their operations that most spend big bucks on programming their manufacturing systems to monitor critical production parameters.

The processes themselves remain distinct enough from company to company that off-the-shelf solutions are few and far between. Computer-aided software engineering (CASE) tools are helping the companies in this sector tackle the necessary custom programming and maintenance.

The Top 10 in Food & Beverages

Food and beverage producers are thirsty for software but don't have much of an appetite for hardware.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
Occidental Petroleum	+	19,417	302	12/31
RJR Nabisco	=	16,956	1,393	12/31
Pepsico	+	13,007	762	12/31
Sara Lee	=	10,424	325	6/30
ConAgra	=	9,475	155	5/25
Anheuser-Busch	+	8,924	716	12/31
Coca-Cola	+	8,338	1,045	12/31
Beatrice	=	7,505	529	N/A
Borden	=	7,244	312	12/31
Archer Daniels Midland	=	6,798	353	6/30

Source: Business Research Group

CIM Gets Top Shelf Treatment

CIM represents the single most important IS investment at Ralston Purina Co., according to Mary Patterson, CIM program manager at the St. Louis company. The dog chow producer, which ranks No. 12 in revenues in its sector, will be lapping up distribution systems and networking products. The importance of flexible manufacturing to Ralston Purina is reflected throughout the industry—even for leader Occidental Petroleum Corp., whose Dakota City, Neb.-based IBP Inc. food subsidiary places it in this sector.

Producing goods with limited shelf lives must be closely coordinated with activity at the retail level. Much of the food and beverage industry's IS budget, therefore, goes to monitoring customer demand, tracking sales volumes and balancing inventories. As with other industry sectors with wide-ranging suppliers and customers (distributors and retailers in this case), the consumables sector is moving quickly to implement sophisticated electronic data interchange (EDI) systems. EDI links between the corporations and their distributors are particularly important, given the influential linchpin position distributors hold in this industry.

Most companies in this sector are reserving top shelf space for CIM, custom programming and EDI. But they still haven't lost sight of the importance of using information technology to predict and measure demand for their products. Continual surveying of customers' preferences, needs and buying habits heightens demand for statistical analysis software and systems. The data from such analyses can have a significant positive or negative impact on a company's bottom line.

Food and beverage makers, like their peers in the retail sector, deal with commodity-level products that must be transported to numerous locations around the country or the world. To ease this logistics burden, many of the firms build manufacturing plants at several key distribution centers. While this approach simplifies the routing of goods to their destinations, it requires increased IS coordination between the central facility and the far-flung sites. As a result, telecommunications expenses are beginning to eat up a greater percentage of the overall IS budgets in this sector. ▭

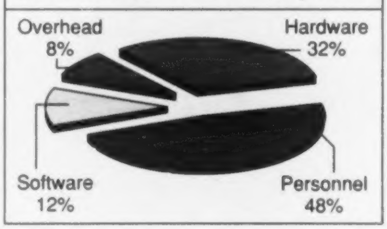
INDUSTRY-BY-INDUSTRY SURVEY
HEALTH CARE & PHARMACEUTICALS

Pharmaceutical firms have few rivals in the use of advanced IS tools.

Companies Take Ample Doses of IS Medicine

Hospitals, drug producers and other companies in the health care and pharmaceuticals sector are taking an ample dosage of information systems medicine these days. Supercomputers, workstations, networks and software used to run these medical giants are swallowing about 2.6% of their revenues. The top 10 corporations last year directed about $1.6 billion of their $60.4 billion in revenues toward their IS operations, writing a technology prescription that they hope will keep them in good health for the 1990s.

Distribution of IS Funds, 1988



This year, IS spending throughout the sector should remain even as a percentage of overall sales. But there are differences worth noting. Pharmaceutical companies, which dominate the sector, are ramping up their IS investments, as increased competition and regulation forces them to rely more and more on information technology to steer new discoveries through the design and approval stages. Health-care operations, under pressure to control costs as much as possible, are increasing their IS outlays at a slower rate. This difference can be traced in large part to the fact that the health care providers function primarily as service organizations, whereas the pharmaceutical companies are research, development and manufacturing concerns.

Hospitals focus much of their IS budgets on the processing and storage of patients' records and bills. Database management software, midrange computers and high-capacity storage subsystems thus continue to draw significant funds. Hospitals, like commercial banks, are developing image-processing techniques to reduce the burden of paper records. But unlike financial firms, hospitals take their time actually acquiring such advanced technology IS tools—devoting far more of their new equipment budgets to leading-edge medical products.

The Top 10 in Health Care & Pharmaceuticals

Drug makers' IS spending is up to meet increased competition, but health-care providers are slowing IS spending to cap costs.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
Johnson & Johnson	+	9,000	974	12/31
McKesson	=	7,298	95	3/31
Baxter International	=	6,861	388	12/31
Bristol-Myers	=	5,973	829	12/31
Merck	+	5,940	1,207	12/31
American Home Products	=	5,501	932	12/31
Pfizer	+	5,385	791	12/31
Abbott Laboratories	=	4,937	752	12/31
SmithKline Beckman	-	4,749	229	12/31
Bayer USA	-	4,719	124	12/31

Source: Business Research Group

Health-care facilities aren't hesitant, however, to follow the trend toward distributed computing—taking advantage of portable computers, workstations and networks to distribute more knowledge about patients and other aspects of medicine throughout their centers.

Pharmaceutical firms have few rivals in the use of advanced IS tools. Computer graphics systems, in particular, constitute a growing part of these companies' hardware and software expenditures. Using everything from networked workstations to supercomputers, the drug companies are employing scientific visualization techniques to see drug structures and predict how drugs will interact with molecules. In docking simulations, for example, researchers can watch sequential image frames showing how a drug and its target molecule link—or fail to link—with one another.

Working on IS Prescriptions

Such advanced research techniques require talented programmers to write customized software. That's why, perhaps, the sector spends more than the average on personnel and software. The pharmaceutical firms also devote considerable resources to conducting drug trials and to developing statistical models to track the experiments' results. And the compute power devoted to compliance with government regulations and record keeping is significant.

Once drugs are developed, they must be manufactured with precision and, often, in great quantity. Here again, pharmaceutical engineers turn to computer modeling to help develop bulk-manufacturing techniques for drugs that typically are produced in relatively minute quantities during the research phase. Once production techniques are established, exacting computer control is required to ensure drug purity. As a result, pharmaceutical companies are among the most advanced of all firms in their use of precision process manufacturing. ▭

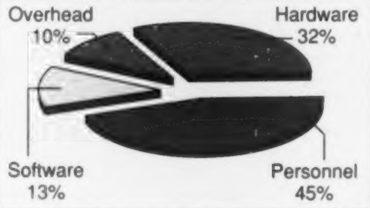
Big insurers are major users of networks, both local and long distance.

Health and Life Insurers Cut Risks via IS Coverage

Insurance industry leaders spent 1.7% of the $149.7 billion in revenues they achieved in 1988 on information systems and resources that would allow them to write substantially more policies while considerably reducing their risk. Insurance firms allocated 13% of their overall IS budgets to software in 1988—well above the industry norm of 10%—in large part because of outlays for sophisticated database management programs and transaction-processing applications.

Typical of most service companies, insurers rely heavily on IS to help their agents serve their clients as effectively and efficiently as possible. And, while much of the industry's spending goes for traditional systems and software, some firms are investing in more innovative projects to attain these customer service goals.

Distribution of IS Funds, 1988



Metropolitan Life & Affiliated Cos., for example, is currently wrapping up two pilot image-processing projects designed to improve customer service. One project electronically stores pension department documents and links them to related on-line data. The other project replaces file folders in the New York City-based company's disability claims area.

Once the pilot projects have been assessed, the lessons learned will be applied to other applications throughout the company, says Dan Cavanagh, vice president of management information systems. His company also hopes to save a considerable amount of money by storing documents in electronic form instead of on paper. This may be bad news for filing cabinet vendors, but suppliers of hard disk and optical recording subsystems can expect to benefit from this trend.

The Top 10 in Insurance

Increasing competition in this traditionally conservative industry is driving some firms to adopt innovative IS technologies.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
Aetna	+	24,296	713	12/31
ITT	+	19,355	817	12/31
Travelers	=	18,986	103	12/31
Cigna	-	17,889	472	12/31
Metropolitan Life	=	15,487	836	12/31
Prudential	=	14,397	877	12/31
American International	+	13,613	1,217	12/31
Loews	=	10,865	909	12/31
Transamerica	=	7,879	346	12/31
New York Life	=	6,929	256	12/31

Source: Business Research Group

One inescapable part of doing business in the insurance industry is the need to communicate with agents across the country. Big insurers are major users of networks, both local and long-distance. Only the banking and financial service firms are as dependent upon telecommunications as are these companies.

But passing information to and from their agents is only part of the task insurers are undertaking. The Travelers Corp., for example, is actively promoting automation at the agencies themselves. Through its Travelers/EBS Inc. subsidiary, the company attempts to sell to its independent insurance agents integrated systems that automate functions such as accounting and marketing support. Travelers plans to supplement these automation efforts by helping to push common insurance industry system interfaces and document format standards, says Larry Bacon, the company's senior vice president for data processing.

Giving Agents an IS Umbrella

Managing health-care benefits is another function receiving more of Travelers' IS resources. To help stem rising health-care costs, the Hartford, Conn.-based insurer offers a wider range of coverage options to its group health care and employee-benefits customers. The new program is intended to enable an employer to offer workers a menu of coverage options from which to pick and choose. Providing such flexibility will require major information system upgrades at the insurer, several of which will be aimed at integrating data from several different benefits programs.

Integration also is an objective of the stepped-systems investments that many insurers are making. The sector already makes on-line transaction processing a policy; nearly 50% of all insurers indicate that they already use OLTP systems. With new products forthcoming from leading OLTP vendors such as Digital Equipment Corp. and Tandem Computers Inc. later this year, one can fully expect insurance companies to up the rate of OLTP use. ▭

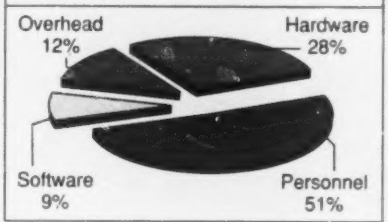
Metal products companies invest more of their IS budgets in design and engineering systems than their ore-oriented brethren.

Metal Makers Bend IS To Fit the Future

Several metals producers had a rough year in 1988, sending the sector's bottom line into the scrap heap. Despite losing $290 million on $50.8 billion in revenues, the top 10 metals companies displayed tough information systems mettle. As a group, they spent $1.1 billion on IS—2.2% of industry revenues, just a tenth of point below the average for all 12 sectors in 1988.

One reason that IS wasn't scrapped last year is that the sector's losses weren't universal; rather, they were limited to a very few companies. LTV Corp. was only one of three companies in the sector to lose money in 1988, but the magnitude of its losses—$3.2 billion on revenues of $7.5 billion—dragged down the entire sector's earnings performance. This loss, combined with lesser but still significant amounts of red ink at Combustion Engineering Inc. and Triangle Industries Inc., offset strong profits at firms such as the Aluminum Co. of America (ALCOA) and AMAX Inc.

Distribution of IS Funds, 1988



Metals producers apparently believe that people are as valuable a part of the IS solution as products themselves. The sector will continue to allocate a greater portion of its IS budget to personnel (49%) this year than the survey average (44%), although it is spending less on programmers and the like this year than last. In 1988, 51% of its IS outlays were spent on personnel. These costs reflect the high price metal benders are paying to restructure in an attempt to stave off bankruptcy and foreign competition.

Companies are consolidating operations to improve efficiencies, and this requires expensive programming expertise to merge unlike hardware, applications and databases. These companies also continue to diversify to reduce the impact of falling profits in their core business. Bringing new operations under the corporate umbrella, many of which have virtually no relationship to the metals business, puts additional strain on the information systems and the IS personnel that must attempt to interact with the newcomers' IS facilities.

Focusing IS on the Process

The key IS investments in this sector remain centered on equipment and personnel directed at the manufacturing process itself. This focus starts in improved scheduling of raw materials shipments, with many of the firms moving toward just-in-time (JIT) deliveries. As within other industries, JIT manufacturing is being accomplished by establishing electronic data interchange (EDI) links with core suppliers as well as with major customers in the auto and industrial sector. The metals companies hope to use improved coordination between the demand and supply sides to keep their plants running at full capacity for longer periods.

Within the metals plants themselves, computer-integrated manufacturing is being applied to the production processes, boosting both yields and product quality. Each plant can produce hundreds or thousands of variations in its products, making the facilities a natural match for the precision afforded by advanced computer controls. The metals producers look at IS spending as a way to reestablish their reputations as dependable sources of high-quality and low-cost materials.

The companies making metal products, such as The Gillette Co., are likewise establishing JIT programs and EDI links, and are pumping considerable monies into factory-floor IS. Their plants, however, are discrete manufacturing facilities, as opposed to the process plants of the metals producers. As such, they are somewhat more amenable to off-the-shelf digital controls—often avoiding the custom programming expenses being incurred by the metals producers in their plant modernization efforts.

The metal products companies, however, invest more of their IS budgets in design and engineering systems than their ore-oriented brethren. Following the lead of the auto and aerospace firms, these companies are performing more of their research and development with graphics systems and engineering algorithms and less through traditional prototyping means. ▭

The Top 10 in Metals

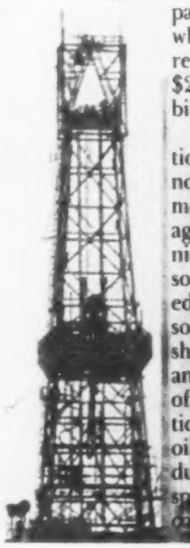
Metal makers, consolidating operations to improve efficiencies, are investing in pricey programming personnel.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
ALCOA	+	9,795	861	12/31
LTV	-	7,526	(3,154)	12/31
Reynolds	+	5,567	482	12/31
Bethlehem Steel	=	5,489	403	12/31
Triangle Industries	-	4,104	(54)	12/31
Inland Steel	=	4,068	262	12/31
AMAX	+	3,944	741	12/31
Gillette	=	3,581	269	12/31
Combustion Engineering	-	3,484	(245)	12/31
Armco	=	3,227	145	12/31

Source: Business Research Group

The major oil and gas companies are perhaps the most ambitious of all sectors when it comes to AI.

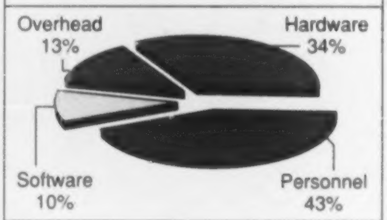
Oil Companies Exploit As Much as Explore IS



Unlike 1987, when Texaco Inc.'s $4.4 billion loss severely tarnished the profitability of the oil sector, 1988 was in the black for all of the 10 leading petroleum companies. Total revenues dropped slightly, however, while the 1.3% of revenues devoted to IS budgets remained constant. From their 1988 revenues of $282.3 billion, this industry's leaders directed $3.7 billion to IS items.

Long in the forefront of all firms in the exploitation of supercomputer technologies and sophisticated modeling and analysis packages, the petroleum companies have begun to scale back somewhat in such leading edge expenditures. One reason for this is an industrywide shift away from exploration and toward the exploitation of existing reserves—a condition brought on by depressed oil prices, according to one industry source. Still, only the automotive and aerospace companies invest more in commercial supercomputers than petroleum firms.

Distribution of IS Funds, 1988



Decentralization Drives New IS Push

These companies are also facing the problems associated with IS decentralization. "Our IS systems, which were built for monolithic structures, now must face the needs of business unit structuring, where organizations are being split into autonomous organizations with profit and loss responsibility," says E.D. McDonald, division manager of information processing at Texaco's Houston headquarters. "Whether these systems will be appropriate in a decentralized organization, or whether they will have to be rebuilt is a question that will put considerable pressure on our IS operation," he says.

The Top 10 in Petroleum

Oil companies have begun to scale back on leading edge IS expenditures in an effort to exploit existing reserves.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
Exxon	=	79,557	5,260	12/31
Mobil	=	48,198	2,087	12/31
Texaco	-	33,544	1,304	12/31
Chevron	+	25,196	1,768	12/31
Amoco	=	21,150	2,063	12/31
Shell	=	21,070	1,239	12/31
Atlantic Richfield	=	17,626	1,583	12/31
USX	-	15,792	756	12/31
Phillips Petroleum	=	11,304	650	12/31
Unocal	=	8,853	480	12/31

Source: Business Research Group

Despite the importance of the decentralization trend, McDonald identifies electronic data interchange (EDI) as the IS area that will benefit from Texaco's most aggressive spending in future months. Many of Texaco's competitors have similar objectives. The company plans to establish EDI connections with its suppliers and its customers. It also hopes to be a driving force in shaping the sector's EDI standards so that they conform to the intercompany transaction methods traditional to the oil and gas industry. For example, Texaco is a member of an American Petroleum Institute subgroup examining ways to arrive at a standardized format for billing one another for gas and oil supplies.

The major petroleum firms have long devoted significant proportions of their IS budgets to supporting and interacting with the distributors and retailers who handle the refined products. Order processing, scheduling, shipping and billing are all highly automated at these companies. Some also run credit card operations, which burdens them with many of the record-keeping and transaction-processing expenses faced by firms in the banking and financial services sector.

Virtually all of the leading oil and gas companies are conducting multiple pilot projects in expert systems, and many have already placed such systems on line. The areas of expertise being coded into computer-based rules include geological analysis, process control, the analysis of chemical spills and the projection of business plan results.

Even though the petroleum companies spend less of their revenues on IS than firms in many other sectors, the funds spent here are often devoted to the most advanced and innovative of IS projects. Because such IS experimentation often is difficult to categorize as a hardware, software or personnel expense, it tends to push the sector's overhead IS expenses above the average. In 1989, oil companies are expected to devote 13% of their IS budgets to overhead, while 43% will go toward human IS resources, 34% to hardware and 10% to software. ▭

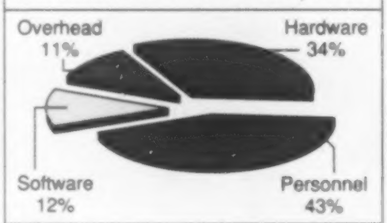
Managing and operating data-processing facilities is not a strategic function. Using the information is.

Krypton
Lanthanum
Lead
Lithium
Lutecium

Shaking up The Process

Dominated by the large chemical and paper companies, the process industry spent 2.1% of its 1988 revenues for information systems—slightly below the average for all 12 sectors in this year's survey. This shortfall can be partially explained by the fact that some of the expensive factory controls the sector acquires are not included in corporate IS budgets.

The 10 process leaders distilled about $3 billion of their $142 billion in revenues for IS purposes in 1988. The distribution of this spending was close to the overall industry averages, with slightly more of their budgets (12%) going for software and slightly less (43%) paid to personnel. They spent average amounts on hardware (34%) and IS overhead (11%). This year, they are again expected to invest heavily in software (13%) and hardware (35%) at the expense of personnel (42%) and overhead (10%).



Distribution of IS Funds, 1988

Although obvious differences exist between timber and paper companies such as Weyerhaeuser Co., chemical producers such as DuPont and consumer goods giants such as The Procter & Gamble Co., the process leaders have much in common when it comes to their IS requirements.

Foremost is the need to produce, manage and distribute extensive product lines that typically consist of hundreds, if not thousands, of items. As in all sectors, the process firms are moving toward just-in-time inventory/manufacturing flows. But with such finely segmented product lines, the lists of raw components necessary from extensive supplier networks can be staggering. The only option for maintaining vast and expensive inventories is the ongoing establishment of electronic data interchange (EDI) networks that will balance fluctuating product sales with on-demand supplier shipments.

The Top 10 in Process Industries

Process firms are using electronic data interchange to keep chemicals, paper and consumer goods flowing.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
DuPont	+	32,514	2,190	12/31
Procter & Gamble	=	19,336	1,020	6/30
Kodak	=	17,034	1,397	12/31
Dow	+	16,682	2,398	12/31
3M	=	10,581	1,154	12/31
Weyerhaeuser	-	10,004	564	12/31
International Paper	=	9,533	754	12/31
Georgia-Pacific	-	9,509	467	12/31
Union Carbide	=	8,324	662	12/31
Monsanto	=	8,293	591	12/31

Source: Business Research Group

The top 10 process corporations also rely heavily on computers in their research and development operations. Computers assist in monitoring and simulating chemical interactions and help formulate manufacturing processes that will generate higher quality and higher yields. Local networks connect these and other departments to one another to help ensure that development isn't carried out in isolation from manufacturing engineers or marketers.

One sector leader, Eastman Kodak Co., has just begun implementing a radically different IS organization plan that could add color to IS life in every sector. The Rochester, N.Y.-based company is spinning off its data center operations to IBM, which will set up and staff a new data-processing center consolidating the operations of four existing Kodak facilities. As part of the agreement, IBM will hire about 275 of the personnel now at the Kodak operations to work at the new data center. Some analysts expect Kodak to cut its data-processing costs by as much as 40% via the innovative arrangement; the company will only say it expects to realize double-digit percentage savings.

A Radical Approach

"In evaluating our IS operations, we concluded that managing and operating data-processing facilities is not a strategic function. Using the information is," explains Henry Pfendt, director of Kodak's information technology service. He says IBM will be able to leverage its existing infrastructure and large customer base to run the data operations much more efficiently than Kodak can. He also promises that the film maker's IS budget will be redirected, not reduced.

Much of the savings realized by Kodak will be spent on developing software applications in the company's various lines of business. "Our strategy is to centralize the infrastructure and to decentralize the applications development," Pfendt says.

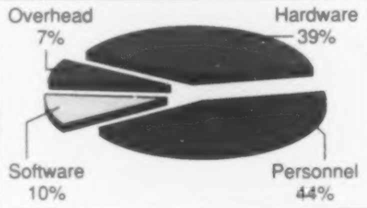
When it comes to retail IS spending, the emphasis can be described in three words: inventory, inventory, inventory.

Stores and Supermarkets Place Limited Stock in IS

As much as Americans love to shop, it doesn't seem to rub off on the shops they buy from, which do the least amount of information systems shopping of any sector in U.S. commerce and industry. The top U.S. retailers spent less than 1% of their revenues on IS in 1988. From revenues of $197.8 billion, they spent 0.8% on hardware and the like—an IS price tag totaling $1.6 billion.

The sector does have peculiar IS shopping habits, despite having little money for technology spending sprees. It buys more hardware as a percentage of its overall IS budget than almost any other sector. This year, 40% of its IS dollars will go toward point-of-sale systems, department store midrange systems and other hardware used to move and sell goods. It will allocate slightly more (41%) of its budget for personnel to program POS systems and run other equipment. Retailers will spend an average amount (11%) on software, but less than average on IS overhead (8%).

Distribution of IS Funds, 1988



When it comes to IS spending at these firms, the emphasis can be described in three words: inventory, inventory, inventory. Keeping shelves stocked with fresh food or current fashions requires constant inventory turnovers. As hundreds of thousands of items are ordered, priced, coded and stocked, computer and communications systems form the linchpins that keep the retail operations from spinning out of control.

The inherent complexity of inventory maintenance at these companies has been exacerbated by growing industry competition between the discount department stores and the more traditional establishments. Inventory turnover of clothing fashions has accelerated at many of the retailers in an attempt to keep customers returning regularly to the stores.

One of the most visible salvos in the battle for customer dollars was Sears, Roebuck and Co.'s much-publicized price-cutting strategy, which the No. 1 retailer implemented in a dramatic blitz earlier this year. The giant retailer reduced the price of its products across the board, from refrigerators to screwdrivers to baby clothes, and consequently had to revamp volumes of electronically stored product records.

As intense as the department store competition gets, these stores can't hold a candle to the supermarkets in terms of inventory management and turnover. Fall fashions may last for only a few weeks before being replaced, but that time is an eternity for milk, bread and cantaloupes. The proliferation of bar code readers at point-of-sale terminals has significantly aided the grocers' ability to track product sales and inventory depletion. Reordering is often handled electronically, as is billing and payment.

Electronic Pricing and Ordering

Perhaps no other industry sector stands to gain so much through the advent of electronic data interchange with suppliers. Using EDI, retailers receive the bulk of their shipments from a limited number of distributors who stock extensive catalogs of goods. This distribution network helps limit the number of store/supplier EDI links required. Supermarkets, however, tend to rely to some extent on small local suppliers, and it will be some time before EDI links with these companies will be cost effective.

Another key IS expenditure for the retailers is the establishment and maintenance of employee record databases. The stores employ hundreds of thousands of people, many on part-time schedules, and offer a variety of compensation and benefits packages. These corporations are thus major purchasers of database management systems and mass-storage subsystems. They are also among those most interested in improved operator/database interfaces, such as natural-language query capability. ▭

The Top 10 in Retailing

Retailers are apparently not born to shop for IS goods, spending less than 1% on information technology.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
Sears, Roebuck	+	50,251	1,454	12/31
K Mart	=	27,301	803	1/31
Wal-Mart	=	20,649	837	N/A
Kroger	-	19,053	35	12/31
American Stores	=	18,478	98	N/A
J.C. Penney	+	14,833	807	12/31
Safeway	-	13,612	31	12/31
Dayton Hudson	=	12,204	287	2/1
May Department Stores	=	11,921	534	12/31
A&P	=	9,532	103	2/29

Source: Business Research Group

Many companies are struggling with the choice between expanding their existing systems or upgrading.

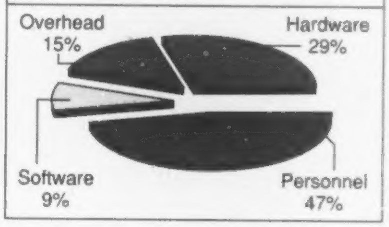
Phone Companies Call On IS For New Services

The leading telecommunications suppliers top all other industry sectors in one important measure of information systems spending. In 1988, they allocated 4% of their $132.4 billion in revenues toward IS systems and resources that would make calling simpler, expand their service offerings and make it easier for their customers and suppliers to do business with them. That figure is far above the 2.3% average for all 12 of the sectors in our survey.

Measured against profits, IS spending by AT&T, GTE Corp. and others in the sector is nearly as impressive. Although the sector ranked fifth in earnings among the 11 nonbank industries surveyed, its overall IS budget of $5.3 billion placed it third in IS spending in 1988. Only the auto/industrial and electronics sectors spent more in absolute IS dollars. In fairness to other companies in the sector, the only reason it didn't rank higher in profitability was because AT&T wrote down its obsolete network assets, incurring $1.7 billion in losses in the process.

The line between corporate IS spending and telecommunications spending is often a thin one at top companies. Long-distance services such as 800 and 900 numbers, for example, are company products, but they fall within the purview of the IS departments.

Distribution of IS Funds, 1988



The Top 10 in Telecommunications

Telecom companies are the big spenders of the U.S. economy, devoting fully 4% of their revenues on IS.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
AT&T	=	35,210	(1,669)	12/31
GTE	=	16,460	1,225	12/31
BellSouth	+	13,597	1,666	12/31
Nynex	=	12,661	1,315	12/31
Bell Atlantic	=	10,880	1,317	12/31
American Information	+	9,903	1,237	12/31
Pacific Telesis	=	9,483	1,188	12/31
US West	=	9,221	1,132	12/31
Southwestern Bell	=	8,453	1,060	12/31
United Telecom	-	6,493	509	12/31

Source: Business Research Group

Aside from the maintenance and operations of the networks themselves, no task is of greater importance to the phone companies than timely and accurate billing systems. As telecom companies give residential and business customers more service options, billing becomes more complex, and the demands on their IS systems increase. The rise in new services such as cellular phone calls only adds to such complexity. The billing operations usually have some over-capacity built in to deal with peaks in seasonal demand, but this extra processing power is being consumed fairly quickly. Many of the phone companies are struggling with the choice between expanding their existing systems or upgrading to more powerful computers.

Calling Office Automation

Telecommunications providers are among the most advanced of all companies when it comes to office automation. The vast majority of their office-based employees work on personal computers or mainframe-linked terminals. Customer service departments, in particular, are highly automated, enabling them to call up individual records quickly and effect service modifications remotely. The top 10 companies thus invest heavily in personal computers and in off-the-shelf software such as word-processing and spreadsheet packages. They are, appropriately, also big buyers of local area networking and electronic mail products.

AT&T's divestiture is still having a ripple effect on the sector's IS spending. The seven regional Bell operating companies (RBOCs) created by the 1984 breakup are still in the process of consolidating the different computer systems they inherited from the local telephone companies. Some incompatible systems are being linked via applications software developed by in-house IS staff at regional Bell companies, permitting necessary data exchanges. In other cases, the RBOCs have standardized on the dominant or most cost-effective system, such as computers that run the UNIX operating system. In such cases, they are replacing outmoded hardware and software, writing them off their balance sheets as obsolete assets. The short-term strain on profits created by such write-offs pales in comparison with the long-range gains in efficiency created by standard systems and software.

The field maintenance staffs of the telecommunications companies depend on extensive backup support from the central office computers. But the advent of powerful and lightweight laptop computers is placing more processing power in the hands of the field personnel themselves. Equipped with modems, the laptops can be linked to the central databases of telecommunications companies to upload and download information pertinent to repairs, installations and troubleshooting operations. ▭

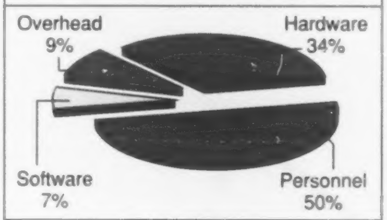
The corporate offices of transportation giants are case studies in distributed computing.

Airlines Fly by Their IS Seats

The top 10 transportation companies traveled faster and farther on information systems than did most other sectors in 1988. Together, they spent $2 billion or 2.6% of their $76 billion in revenues on systems resources to deliver packages sooner, arrive on time more frequently and haul freight more efficiently.

The IS routes of the high fliers haven't changed much in going from there (1988) to here (1989). They allocated 50% of their IS dollars for personnel in 1988; they'll spend 48% of them on salaries and training this year. They bought hardware with 34% of their IS budgets last year; they'll spend as much on computers this year. They earmarked 7% for software in 1988; they're spending 8% of their IS dollars for systems and applications software in 1989. They experienced IS overhead expenses totaling 9% of their budgets a year ago; they have inched up to 10% today.

Distribution of IS Funds, 1988



The high IS staff costs that continue to distinguish the transportation companies from most other sectors are due, in part, to their effort to develop in-house applications programs that will help distinguish their services from competitors'.

Competition is also heating up among the providers of computerized reservation systems. AMR Corp.'s SABRE, which controls 40% of the worldwide reservation market, is being challenged by the Covia Partnership's Apollo system. Covia—owned by UAL Inc. and a consortium of other carriers—is aggressively adding new services in an attempt to win over new users. As SABRE and Apollo attempt to one-up each other, they will demand increasing portions of their parents' IS budgets. The other three reservation systems—PARS from Trans World Airline Inc. and Northwest Airlines, Delta Air Lines Inc.'s Datas II and System One from Continental Airlines Inc.—are also adding features to keep up.

The Top 10 in Transportation

Transport firms find that above average spending on IS lets them deliver sooner, arrive on time and haul more efficiently.

Company	IS Intensity	Revenue ($Mil)	Profit ($Mil)	FY End
United Parcel Service	+	11,032	758	12/31
UAL	+	9,015	1,124	12/31
AMR	+	8,824	477	12/31
CSX	=	8,668	147	12/31
Texas Air	-	8,573	(719)	12/31
Delta	=	6,915	307	6/30
Union Pacific	=	6,794	644	12/31
USAir	=	5,707	165	12/31
NWA	=	5,650	135	12/31
Santa Fe Southern Pacific	-	4,935	(47)	12/31

Source: Business Research Group

Case Studies in Distributed Computing

A significant amount of the airlines' budgets goes to office automation. The corporate offices of transportation giants are case studies in distributed computing and networking. Their airport-based operations are not exactly old fashioned, either. Most support their ticket agents with personal computers and remote terminals linked to the corporate information systems.

Where the airlines spend money on computerized reservations systems, United Parcel Service spends it on its shipping and tracking systems. In addition to maintaining flight schedules, UPS must maintain a worldwide fleet of trucks and must track millions of packages. In the highly competitive overnight delivery business, the level of customer service can quickly make or break a shipper's reputation. Companies such as UPS must be able to instantaneously locate any one of their millions of shipments. UPS spends sizable sums to maintain and upgrade its customer databases, which turn over completely every few days as new packages enter the system and old ones exit. With worldwide operations, the company is also a big consumer of telecommunications services.

Although railroads continue to lag behind the airlines and the delivery services in IS spending, they are building up IS steam. At Santa Fe Southern Pacific Corp.'s Chicago headquarters, virtually all of the 135 corporate staff members have their own personal computers. The company recently sold its IBM model 4381 mainframe in favor of PCs, porting all of its critical applications software to the desktop systems. Some applications that defied conversion were turned over to an external service bureau, says Tom Kolb, manager of information systems for the railroad.

Railroad companies also are directing a good part of their IS budgets toward dispatching trains and monitoring their travels. Several well-publicized train crashes in recent years have added incentive to these investments, as human error has often been cited as the cause of many of the wrecks. While the rail companies don't expect to replace engineers with computers, they are installing automated systems that can serve as safety valves when standard procedures fail. ▭

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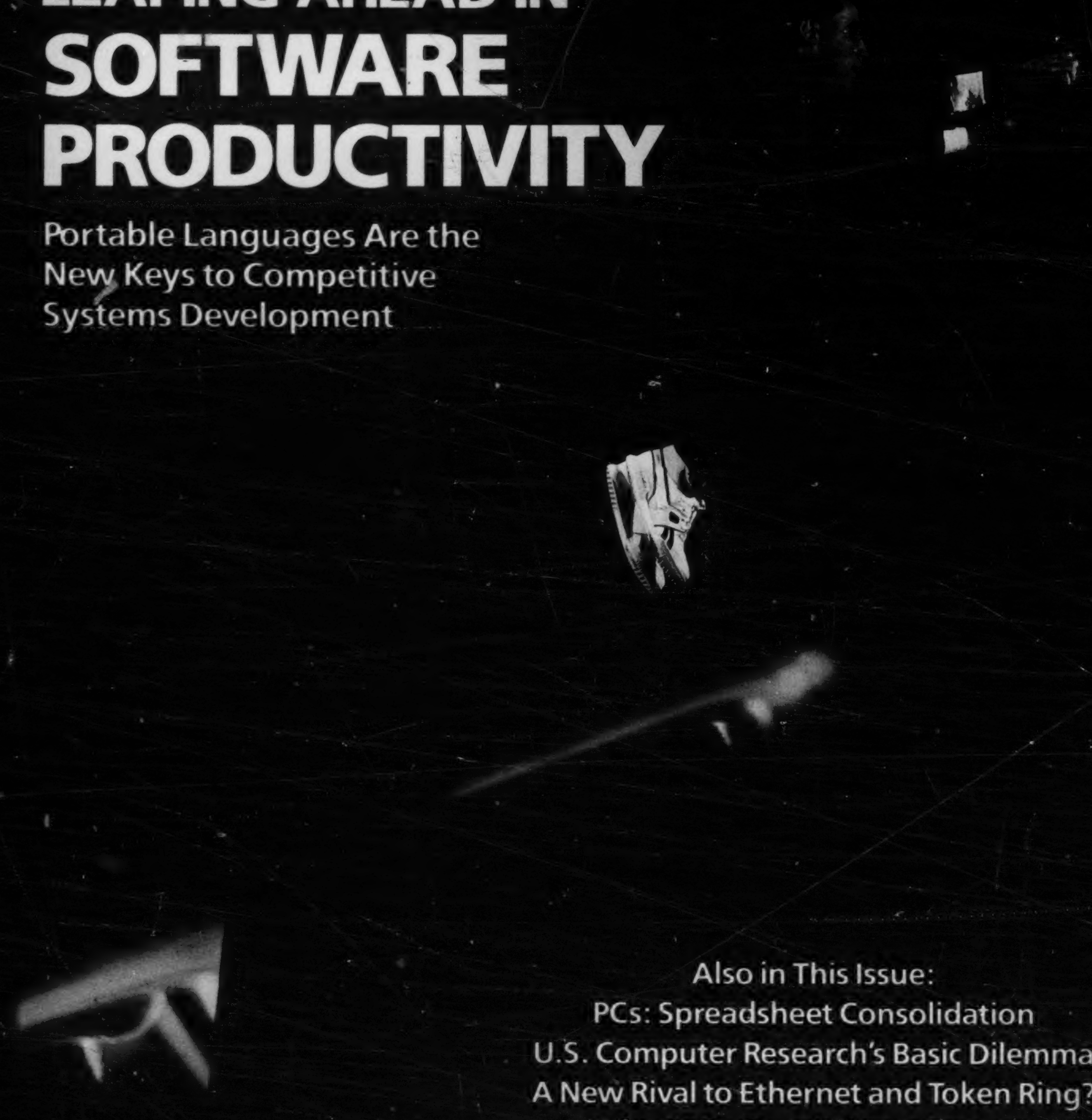

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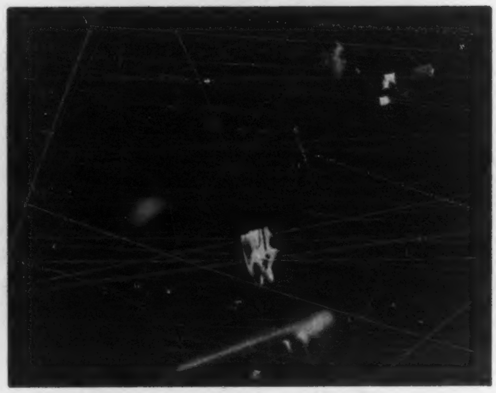

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BY RALPH CARLYLE A new generation of programming languages is cropping up that can be used across different computing architectures. More flexible than vendor-dependent fourth-generation languages, not quite as sophisticated as fifth-generation AI- or expert-system-based languages, these 4½ generation products are providing some remarkable productivity advantages. Some vendors are offering them, and some users are engaging in development endeavors themselves.

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Cover Photography by Ed Braverman

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BY JOHN McMULLEN New and coming releases of PC spreadsheets promise to narrow the functional differences among packages. But, even as spreadsheets become more alike, companies are limiting the number of vendors they allow through their doors. Now, memory use—not functional equivalence—is becoming a more important criterion for selection.

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BY JOHN McMULLEN Using PC macro languages, adventurous nonprogrammer end users are developing their own applications, often without the involvement of IS management.

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U.S. Computer Research's Basic Dilemma 44

BY WILLIE SCHATZ Most private sector businesses are unwilling to support basic computer science research because the payoff comes too far in the future. So, academic computer science researchers must count on government for most of their funding. Once, government nutured advances in such fundamental fields as artificial intelligence. But, with budget squeezes, the emphasis is increasingly on defense-related applied research—at the expense of basic research.

Some Commercial Benefits of DARPA Research 46

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BY CHRIS SIVULA Datapoint Corp.'s ARCnet, long a shadowy part of the local area networking world, is being recast as a high-speed, multivendor network. Will its proprietary past continue to undermine its attempts to challenge Ethernet and token ring?

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BY TOM McCUSKER Upon his retirement from Hughes Aircraft Co., DATAMATION editorial adviser Carl Reynolds is frankly critical of corporate management's failure to recognize the value of IS in increasing business efficiency.

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BY LINDA RUNYAN Six companies that view the world as a single marketplace share their views on information systems strategies and planning.

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1990 International User Group Directory 81

BY KURT ROTHSCHILD What better way exists to investigate a product, service or vendor than by sharing the experiences of your peers? None, we think. That's the purpose behind our annual International User Group Directory, which makes its third appearance with this issue.

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INSIDE DATAMATION

Expanding Computer Technology's Limits

Advancing the outer limit of information technology's use or "pushing the envelope," to borrow a jet pilot's term, should be the ultimate aim of any information system manager.

Ultimately fulfulling this lofty aim requires a lot of mundane details like sparking better understanding of system use among end users, eliminating technobabble from documentation and troubleshooting system bugs. Far from seeming like steps toward that end, however, those numberless daily minutiae are so time consuming and frustrating that they overwhelm any sense an IS manager might have of a greater accomplishment.

Nevertheless, as illustrated in senior writer Ralph Carlyle's cover story, "Leaping Ahead in Software Productivity," IS managers can sometimes transcend the backbreaking routine of system management to generate substantial improvements in applied computer science. The Boston brokerage firm Colonial Group Inc. climbed beyond the software development ceiling as defined by one vendor's fourth generation language. Using a half-generation improvement in programming technology, Colonial got a 3-million-line mutual funds system in half the time and at one-tenth the price it would have cost otherwise.

Photograph by Stephen J. Sherman

COLONIAL'S EMILSON:
A bold new approach.

But what about the quantum leaps ahead? Many notable IS executives have bemoaned what they see as the need for a revolution in, for example, software development technology. From where will this kind of innovation spring? That may well be the question of the hour. Quantum leaps in computer science require long-term research into fundamental principles.

As a nonprofit organization, the federal government theoretically should be the agent for multiple year, fundamental computer science research. And, historically, federal agencies, including the Department of Defense's Defense Advanced Research Projects Agency, have sponsored such research, such as DARPA's work in artificial intelligence in the 1970s. But, as Willie Schatz reports in "U.S. Computer Research's Basic Dilemma," things have changed. Prominent university computer science researchers tell DATAMATION that the pressure in the last few years to target their projects to specific military applications has become oppressive. Worse, nonmilitary funds for computer research have remained stagnant.

As Schatz points out, private industry, with its quarter-to-quarter profit myopia, cannot be expected to take the same risks with long-term research that the government can. Certainly not. But could it do more than it does now?

According to Carl Shepard, an economist at the U.S. Department of Commerce, it can, but only if the "research and experimentation" tax credit is altered. Three things must change, Shepard says. One, the credit must be made permanent; the temporary status it has had for several years makes it usable only for incremental, not long-term, research. Two, it must be made available to start-up firms and new technology ventures of existing firms; right now it is only available for research that relates to a firm's on-going business. Third, and finally, the way the tax credit is calculated must be changed so it does not to punish big R&E spenders.

Legislation that attempts to solve these problems was pending at press time, as the credit is due to expire December 31. With all of Washington's budget considerations, making these changes could get postponed again. Now is the time for DATAMATION's readers to voice a vote and help their industry push the envelope on computer science research.

Marsha Johnston Fisher

Marsha Johnston Fisher, Section Editor

DATAMATION

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Spreadsheet Consolidation

New and coming releases of PC spreadsheets promise to narrow the functional differences among packages. Memory use—not functional equivalence—is becoming a more important criterion for selection.

BY JOHN McMULLEN

As features such as macro languages, standard file formats and linking capabilities become common in the major spreadsheet packages, you would think there'd be fewer reasons than ever for companies to restrict the variety of spreadsheets they allow through their doors. Guess again.

To improve user support and training and simplify upgrade administration, corporations are placing limits on the variety of PC spreadsheet packages they allow. Some businesses are loath to support multiple packages that generally provide the same functions. Others point to costly hardware requirements for newer packages such as Lotus Development Corp.'s 1-2-3 release 3.0 or Microsoft Corp.'s Excel.

Ironically, functional equivalence in the packages may be fueling this vendor loyalty. Functional equivalence makes it easier for users to switch packages when companies standardize on a single package because they no longer have to forego favored functions or spend significant time retraining.

Price Convergence

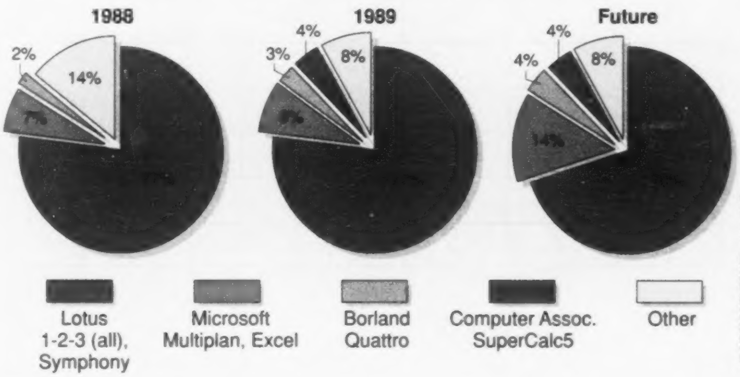
This spreadsheet consolidation is occurring despite the fact that not only functions but prices are converging. Borland International Inc., whose $247 Quattro been the bargain basement spreadsheet, has priced its next version, Quattro Pro, at $495—closer to the prices charged for Lotus 1-2-3 release 2.2, Computer Associates International Inc.'s SuperCalc5 and Microsoft's Excel. Only spreadsheet market leader Lotus departs from the industry norm by charging $595 for its release 3.0 version of 1-2-3.

According to the 1989 DATAMATION/Cowen & Co. survey of PC software purchasing plans, corporations do plan to expand their use of Microsoft's Excel and Borland's Quattro. But the anticipated shift is small. The survey predicts that Lotus 1-2-3 will maintain its two-thirds share of the spreadsheet market this year as it did last year. In addition, more readers this year believe Lotus 1-2-3 will be their principal spreadsheet supplier in the future than thought so a year ago.

Few Users Change Principal Vendors

Surveys of DATAMATION readers' principal spreadsheet vendors show that more people expect to abandon Lotus 1-2-3 than actually do.

% OF RESPONDENTS USING SPREADSHEETS



*SuperCalc5 sales in 1988 were included in the "other" category.

Source: DATAMATION/Cowen & Co.

For example, Price Waterhouse has only one spreadsheet requirement: all spreadsheet files must be stored in Lotus' .WK1 file format, says Steve Owens, a project manager for Price Waterhouse's management consulting services group. "As long as what our people want supports Lotus [files], that's okay," says Owens. That requirement has encouraged Lotus 1-2-3 use over other spreadsheet packages. At Price Waterhouse, Lotus 1-2-3 runs on some 7,000 to 8,000 PCs, outnumbering the second most popular spreadsheet, Quattro, five to one.

If there is going to be any migration away from Lotus, as companies standardize their spreadsheets, the exodus will probably be caused by hardware considerations. In fact, hardware requirements have become the chief means of distinguishing among spreadsheet options. Packages such as SuperCalc5, Lotus 1-2-3 release 2.2 and Quattro Pro occupy only 512KB of PC memory. In contrast, Lotus 1-2-3 release 3 has a larger memory configuration, and Excel requires expanded memory, graphics and mouse support.

While memory prices have fallen recently, the price difference between current-generation PCs and those enhanced for windowing environments is still significant. Some analysts estimate the cost of upgrading a PC to 1MB of memory and providing support for VGA graphics at as much as $2,000. That's a steep price when there can be hundreds to thousands of spreadsheet users in a company.

Playing Hardball With Hardware

GTEL, a Thousand Oaks, Calif., subsidiary of GTE Corp., is one company that found the hardware costs involved in sticking with Lotus to be formidable. The telephone company formerly split its spreadsheet purchases between Lotus' 1-2-3 release 2.01 and Borland's Quattro. But after evaluating Borland's Quattro Pro, GTEL expects to limit its future spreadsheet purchases exclusively to Borland's newest spreadsheet offering.

"We are not looking to completely rethink our spreadsheet strategies," explains John MacCatherine, GTEL's manager of end-user computing. "On the other hand, there's no way we're going to support the hefty 1-megabyte memory requirements for 1-2-3 release 3.0." In contrast, Quattro Pro fits in 512 kilobytes of memory.

☐ **WE'RE NOT INTERESTED IN LOTUS VERSION 3.0. IT EATS MEMORY.**

At independent software vendor Organized Information Corp. (OIC) of Los Angeles, Quattro Pro's ability to fit in that 512KB memory space made it a perfect fit for the firm's PCs. The lower memory demands, coupled with Lotus macro compatibility, are significant advantages, the company believes. "The biggest advantage of Quattro Pro over Lotus 1-2-3 [release 3.0] is a faster-executing product with more functionality on a standard PC XT that needs only 512K of memory," says OIC president David Kramer.

Anaheim, Calif.-based Kwikset Corp., a Black & Decker Corp. subsidiary that makes residential locks, has divided its spreadsheet use between Lotus 1-2-3 release 2.01 and Quattro 1.0. But, in the future, Kwikset plans to wean as many of its PC users as possible from Lotus 1-2-3 to avoid the memory upgrades that a migration to Lotus 1-2-3 release 3.0 would require. "We're just not interested in Lotus version 3.0. It eats memory, and the need for add-ins persists," says Rick Hawkins, computer services coordinator at Kwikset.

Unwilling To Upgrade

And the functional similarities between Lotus and Quattro will only serve to make the switch easier. "If you sit a guy down with Quattro and tell him it's Lotus, he can go on working with little or no retraining," says Hawkins.

So, the more things change, the more companies will make their spreadsheet purchases stay the same. Perhaps that's not too difficult to understand. Users want consistency as well as selection. ▭

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INTERNATIONAL 1990 USER GROUP DIRECTORY

BY KURT ROTHSCHILD

What better way exists to investigate a product, service or vendor than to share the experiences of your peers? None, we think. That's the purpose behind our annual International Users Group Directory, which makes its third appearance with this issue. This year's directory holds 180 user group entries—up from 112 entries last year and 43 entries the previous year. Headquarters for the groups in our 1990 directory span 11 countries on five continents.

Other than the 62% increase in the number of groups listed in this year's directory, the biggest change in our listing this time around is the order in which user groups are arranged. They are listed alphabetically by user group, rather than by vendor, for two reasons. One, the largest number of groups dealing with a particular technology—personal computers—are not themselves organized by vendor. Two, many groups that originally formed around one vendor's products are expanding their constituencies—evidence of their emerging multivendor consciousness.

To make finding your user group—or one that you may be interested in contacting—as easy as possible, we are including two new guides with this year's directory. The first is a cross-reference index organized by vendor name, which can be found on page 104. The second is a technology code, indicating the chief IS orientation of each group. The code, which uses symbols displayed below, appears next to the name of each user group.

Compiled by Susan Mael and Ann Mariano

SOFTWARE
SERVICES
PC'S/ WORKSTATIONS
MIDRANGE SYSTEMS
CORPORATE SYSTEMS
NETWORKS/ COMMUNICATIONS

1990 INTERNATIONAL USER GROUP DIRECTORY

	Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
ACI User Group 330 South 108th Avenue, Omaha, NE 68154 (402)-390-7606	None	None/ 260	Applied-Communications	Entire EFT product line	Eric Bleicher, M & I Data Services Milwaukee, Wis.	Sept. 1990, Atlanta	Quarterly newsletter; periodic committee meetings	Eric Bleicher, (414)-357-2567
The Advisory Group (TAG) P.O. Box 2804, North Canton, OH 44720 (216)-497-5018	$230	275/ None	Diebold	Diebold ATMs	Carol Maness, Central Fidelity Bank Lynchburg, Va.	Sept. 16-19, 1990, New Orleans	One national meeting per year; regional meetings; newsletter	Carol Maness, president (804)-847-9177
Aerospace/Defense User Group 20 University Road, Cambridge, MA 02138 (617)-661-1444	None	1,000/ NA	Project Software & Development; Relational Technology	Project management software consisting of PROJECT/2 and QWIKNET Professional, running on IBM MVS, DEC VMS, PC DOS, and APECS-8000 utilizing DOS	Linda DeMeyer, Aerojet Space Boosters Orangevale, Calif.	Fall 1990	One annual meeting	Chet Talley, coordinator (301)-231-8660
AICorp User Group 100 Fifth Avenue, Waltham, MA 02254 (617)-890-8400	None	2,000/ 750	AICorp.	AI products and services that run on IBM mainframe series 370, 43XX, 30XX or compatibles under the MVS/XA, VM and MVS operating systems	Bob Goldman, AICorp., Waltham, Mass.	Oct. 28-Nov. 1, 1990, Washington, D.C.	One annual meeting; periodic regional meetings and newsletters	Bob Goldman AICorp.
Altai Software User Group 624 Six Flags Drive, Arlington, TX 76011 (817)-640-8911	None	400/ NA	Altai Software	Altai IBM mainframe systems software	Danny McAlpin, Weyerhaeuser, Columbus, Miss.	April 1990, Orlando, Fla.	Two meetings a year; education and training in new products	Bill Cramer, coordinator (817)-640-8911
Amdahl Users Group (AUG) 1250 East Arques Avenue, Sunnyvale, CA 94088 (408)-992-2952	None	600/ 400	Amdahl	All Amdahl products	George Frickle, USWest	April 22-25, 1990, Dallas	One national meeting per year	Chris Wagner (408)-992-2952
American Software Users Group (ASUG) Suite 600, 111 East Wacker Drive, Chicago, IL 60601 (312)-644-6610, ext. 3746	$250	None/ 290	American Software	All ASI products	Martin B. Turpin, A.H. Robins, Richmond, Va.	March 18-21, 1990, Atlanta	Two conferences a year	Kimberly Svevo, administrator (312)-644-6610, ext. 3746
Amstrad User Club Enterprise House, P.O. Box 10, Roper Street, Pallion Industrial Estate, Sunderland SR4 6SN U.K. (44)-91-510-878	£25 £40*	30,000/ NA	Amstrad PLC	Amstrad's range of home computers, personal computers, word processors, portable computers, modems and other peripherals	Eric Innes, Lazahold, Sunderland	NA	Three catalogs a year and three news magazines monthly	Amstrad User Club (44)-91-510-8787
Analyzer International Users Group Inc. (AIUGI) c/o Decision Technology, 4390 US Route 1, Princeton, NJ 08540 (313)-588-7910	None	55/ 0	Decision Technology	Decision Analyzer software product	Jim Wagner, First Federal of Michigan	May 7, 1990	Provides a library of Analyzer routines; conducts an annual product poll; provides information on how to better use the product; annual User and Education Conference	Jim Wagner (313)-588-7910
Apple Computer Clubs (exist in schools throughout the country for grades K through 12) 20525 Mariani Avenue, M/S 36AA, Cupertino, CA 95014 (800)-538-9696	$10.95 per	3,200 clubs/ NA	Apple Computer	Macintosh and Apple II	Craig Elliott, manager, Apple, Cupertino, Calif.	NA	Six newsletters a year; handbook and activity books	Apple (800)-538-9696
The Apple User Group Connection (an umbrella organization comprising 1,300 separate user groups throughout the United States) 20525 Mariani Ave., M/S 36AA, Cupertino, CA 95014 (800)-538-9696	None	500,000/ 125	Apple Computer	Macintosh and Apple II	Craig Elliott, manager, Apple	NA	Monthly newsletter	Apple, (800)-538-9696

* L25 for home users; L40 for professional users.

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Artemis Users Association (AUA) 2900 North Loop, West, Houston, TX 77092 (713)-956-7511							
None	All Metier licensees	Metier Management Systems	All Artemis products	Ian Koenig, System One, Houston	November 1990, Houston	One national meeting a year; quarterly newsletters	Kristy Wetzel, secretary (407)-268-8400
Ashton-Tate (an umbrella group for 700 regional groups) 20101 Hamilton Avenue, Torrance, CA 90502 (213)-538-7455							
Varies	NA/ NA	Ashton-Tate	All Ashton-Tate software packages	None	NA	Quarterly newsletter sent to PC and Macintosh user groups	Marcie Glickman, user group liaison (213)-538-7455
ASSIST (A Shared Solution in Software Technology) 111 East Wacker Drive, Suite 600, Chicago, IL 60601 (312)-644-6610							
$250	500/ 250	Andersen Consulting	Andersen Consulting's software	Chip Lombardo, The Trane Co., Tyler, Texas	May 6-10, 1990, Orlando, Fla.	Two conferences annually; quarterly newsletter	Mary Denten, adminstrator (312)-644-6610
Associacao Nacional dos Usuarios Unisys (ANUNI) Rua Teixeira de Freitas 31 - Sala 1104, 20021 Rio de Janeiro, RJ Brazil (55)-21-221-9480							
NA	NA/ 200	Unisys Electronica	Unisys mainframes	Roberto Macedo, president	May 1990	Two meetings per year; quarterly publication	Georg Herz, external relations (55)-21-217-1133
Association of Banyan Users International (ABUI) 75 Union Avenue, Sudbury, MA 01776 (508)-443-3330							
150/*	700/ NA	Banyan Systems, Inc.	VINES	Todd Sebastien, Metropolitan Life, New York City	April 29-May 2, 1990, Washington, D.C.	Two annual meetings; quarterly newsletter magazine six times a year; on-line bulletin board	Annette Bahro (508)-443-3330
Association of Canadian Users 7100 Woodbine Avenue, Markham, Ontario L3R 5J2 Canada (416)-477-9680							
None	All/ All	McCormack & Dodge Systems Canada	Financial, human resources and tools software	NA	June 17-20,1990, San Francisco	One user conference; quarterly magazine	Doug Hobbs, liaison (416)-477-9680
ATLAS (AMS Tradeline Annual Seminar) 2 Rector Street, New York, N.Y. 10006 (212)-618-0479							
None	50/ NA	American Management Systems	AMS Tradeline banking software for international letter of credit and collection processing.	James Atwood, Wells Fargo Bank	Sept. 1990, Arlington, Va.	One international meeting per year	Elizabeth Seltenhei coordinator (212)-618-0479
Australasian SHARE/GUIDE Ltd. P.O. Box 62, Turramurra, New South Wales 2074, Australia (61)-2-449-6848							
$A865 first year; $A665 thereafter	None/ 240	IBM	IBM System/370 machine architecture, including the IBM AS/400 products; MVS, VM, VSE operating systems; and associated products and services	Ted White, Databank Systems Ltd., Wellington, New Zealand	Feb. 25-28, 1990, Sydney	Two regional meetings per year (within Australia and New Zealand); periodic research publications; support of associated user groups within the Western Pacific.	Ella Leithner (61)-2-449-6848
Banking Automation Research Program (PRAB2) V. le Eginardo 29, 20149 Milan, Italy (39)-2-49931							
L1,600	None/ 15	Data Management	Data Management software related to banking automation	A. Petruzellis, Data Management, Milan	NA	One or two conferences per year	A. Petruzellis (39)-2-49931
BiblioTech Users Group P.O. Box 277, Harvard, MA 01451 (508)-772-2001							
None	NA/ All BiblioTech licensees	Comstow Information Services	BiblioTech Library Software Systems	None	June 1990, Pittsburgh	One national meeting per year; quarterly bulletin	Lynda Moulton, coordinator (508)-772-2001

* $150 for corporate members; $100, non-profit.

1990 INTERNATIONAL USER GROUP DIRECTORY

	Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Key Officer	Next Meeting	Services Provided	Contact
Big Apple Users Group (BAUG) P.O. Box 1822, Old Chelsea Station, New York, NY 10113 (212)-316-1830	$30	250/ None	Apple hardware and multiple software vendors	Macintosh and Apple II	John McMullen, Jefferson Valley, N.Y.	Jan. 1990, New York City	Monthly meetings; special interest groups with monthly meetings; monthly newsletters	Donald Cohen (212)-222-2777
BMC User Group P.O. Box 2043, Sugar Land, TX 77487 (713)-240-8800	NA	136/ NA	BMC Software	IBM mainframes	NA	NA	NA	Linda Koscinski (713)-240-8800
Boole & Babbage User Group (BBUG) 510 Oakmead Parkway, Sunnyvale, CA 94086 (408)-735-9550	None	NA/ 3,000	Boole & Babbage	All Boole & Babbage products supporting MVS, IMS, DB2, CICS, DASD and network management.	Bert Cooley, NY Elec. & Gas Corp., Ithaca, N.Y.	Oct. 1990	Annual meeting	Carol Kaplan, coordinator (408)-735-9550
The Boston Computer Society (BCS) (The society consists of 40 user and special interest groups) 1 Center Plaza, Boston, MA 02108 (617)-367-8080	$40	31,000/ 52	Multiple	Multiple	J. Rosenberg	Jan. 1990	Monthly meetings; newsletters and a magazine	BCS (617)-367-8080
Bull Systems Users Association Europe 5 Square Henri Delormel, 75014 Paris, France (33)-1-45-40-90-14	FF4,000	None/ 300	Groupe Bull	GCOS 6, 7 and 8	J.J. Renault, RATP, Paris	Nov. 1990 Vienna	Two annual meetings; bimonthly newsletter	F. Daigne (33)-1-45 -40-90-14
CADRE Route 206 & Orchard Road CN-8, Princeton, NJ 08543 (201)-874-9000	None	NA/ NA	Computer Associates International	Information Management software	Wendy Stanoff, ADP	Sept. 9-13, 1990, Washington, D.C.	One national meeting per year	Allen Hagger (201)-874-9377
CA Masterpiece Users Group P.O. Box 637, Indian Rocks Beach, FL 34635 (813)-596-1914	None	NA/ 1,500	Computer Associates International	Financial products that run on IBM, DEC and Unisys equipment	David Tilley, Nova Corp. of Alberta	March 11-14, 1990, New Orleans	Two annual conferences; advisory committees for product enhancement; input to vendor	Sheri Shuey, treasurer (813)-287-9241
CDRS User Group 6111 North River Road, Rosemont, IL 60018 (312)-698-3000	None	None/ 1,258	Comdisco Disaster Recovery Services	All	Raymond Hipp, Comdisco	Feb. 28-March 2, 1990 San Francisco	One national meeting per year; quarterly newsletters	Carol Madares (312)-698-3000
CHAMPS User Group Meudon Avenue, Farnborough, Hampshire GU14 7NB U.K. (44)-2-52-544321	None	NA/ 200	Thorn EMI	CHAMPS Hotel System	John Davey, Mount Charlotte Hotels	Jan. 1990	Meetings/demonstrations	Anne Kennedy (44)-2-52-544321
Club Des Utilisateurs Bull Europeens (CUBE) 43, rue de la Chaussee d'Antin 75009 Paris, France (33)-1-48-74-94-17	FF1,800 -4,200	1,200 societies/ NA	Bull S.A.	GCOS 8, CGOS 7, CGOS 6, CGOS 4, UNIX, CTOS, MS/DOS, Multics; DPS 9000, DPS 8000, DPS 8, DPS 7000, DPS 6, DPS 4, DPX, Questar 400, PC (MICRA) Mathilde, (NIP)	Roland de Conihout, Groupe Henner Methodes et Informatique Paris	May 29-June 1, 1990, Strasbourg, France	150 to 200 meetings each year	M. Jean Rota, vice chairman (33)-1-48-74-94 -17
Cognos International Users' Group (an umbrella organization for local and regional Cognos users groups worldwide) 3755 Riverside Drive, Ottawa, Ontario K1G 3Z4 Canada (613)-738-1440	None	NA/ None	Cognos	All systems software products produced by Cognos.	NA	NA	Various local and regional meetings; quarterly newsletter.	Anne Betz, coordinator (613)-783-6849
College and University Systems Group Users 1777 North Kent Street, Arlington, VA 22209 (703)-841-6000	None	86 sites/ 0	American Management Systems	All college and university financial products.	Bonnie Gonzales, Arizona State Univ.	June 3-7, 1990, Orlando, Fla.	One annual meeting per year; three steering committee meetings throughout year; quarterly newsletter.	Dorothy Cotman, coordinator (703)-841-6000

1990 INTERNATIONAL USER GROUP DIRECTORY

	Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
COLT User Group New City Court, 20 Thomas Street, London SE1 9RF U.K. (44)-1-407-2717	None	NA/ 8	Software Sciences	COLT	Bernard Harvey, Software Sciences Finance Systems	NA	Quarterly meetings	Bernard Harvey
Commodore (an umbrella group comprising 600 regional groups) 200 Wilson Drive, West Chester, PA 19380 (215)-431-9100	None y oup	NA/ 0	Commodore Business Machines	All Commodore products	None	NA	Regional meetings	Richard Dowdall, coordinator (215)-431-9100
COMMON - A Users Group 11 East Wacker Drive, Suite 600, Chicago, IL 60601 (312)-644-6610	350	Over 4,800/ 0	IBM	AS/400; System/38, 36, 34, 88; 43XX; 9370 and other 370 architecture systems; 5520; Series 1; and Personal Computer.	Robert A. Sutherland, Robert Sutherland Inc.	April 29-May 3, 1990, Chicago	Semiannual conferences; quarterly newsletter and other publications	COMMON headquarters, (312)-644-6610
Computer Associates Visual Information Association (CA-VIA) 1 State Farm Plaza, E-8, Bloomington, IL 61710 (309)-766-2432	None	7,000/ 0	Computer Associates International	Computer graphics products sold by CAI	Ron Blue, Bloomington, Ill.	June 4-5, 1990, St. Louis	One annual conference; quarterl; newsletter; provides support to nine regional groups	Barbara Love, secretary (703)-482-6570
Comshare Users Group 3001 South State Street, Ann Arbor, MI 48108 (313)-994-4800	None	NA/ NA	Comshare	Comshare products	Jay Haney, The Citizens and Southern Corp., Atlanta	Oct. 3-5, 1990, Anaheim, Calif.	One national meeting per year; Eastern and Western regional meetings; quarterly newsletter.	Julie Tite, conference director (313)-994-4800 ext. 442
Comten Users' Exchange (CUE) c/o Ron Block, Donovan Data Systems, 115 West 18 Street, New York, NY 10011 (212)-633-5080	None	200/ 0	NCR Comten	Comten front-end processors	Ron Block, Donovan Data Systems, New York City	April 9-13 1990, Ft. Lauderdale, Fla.	Semiannual meetings	Ron Block (212)-633-5080
CONTROL User Group (CUG) P.O. Box 302, Troy, MI 48007 (313)-641-4644	$250	NA 50	Cincom Systems	CONTROL: Manufacturing software in both the IBM and DEC environments.	John Forrest, Vickers Inc., Troy, Mich.	To be announced	Periodic newsletters	John Forrest (313)-641-4644
Convergent Technologies User Forum (CTUF) 2700 North First Street, P.O. Box 6685, San Jose, CA 95150 (408)-435-3690	$35	NA 83	Unisys/Convergent Technologies	All Convergent Technologies systems	Daniel Leary, Automated Programming Technologies, Birmingham, Mich.	Feb 12-15, 1990, Dallas	Two meetings per year; newsletter	Irene Powers (408)-434-2653
Cooperative Users of Recognition Equipment (CURE) 2701 E. Grauwyler Road Irving, TX 75061 (214)-579-6000	None	None/ 5,620	Recognition Equipment	All REI data capture and image systems	Stewart Kirchner, Data Entry Services Corp., Dearborn, Mich.	NA	One national meeting per year	Carol de la Corte, coordinator (214)-579-5840
CORUS - Cortex Users' Society 138 Technology Drive, Waltham, MA 02154 (617)-894-7000	None	820/ None	Cortex	CorVision software	Bill Ours, Digital Software Group, Simpsonville, S.C.	October 1990, Boston	One meeting per year; four council meetings a year; quarterly newsletter; promotes activities of local chapter meetings	Howard Exton-Smith, liaison (617)-894-7000
Cray User Group (CUG) c/o Gunter Georgi, Grumman Corp. DO9-GHQ Bethpage, NY 11714 (516)-575-2855	$200	None/ 140	Cray Research	All Cray products and interfaces to other vendors' equipment.	Steve Niver, Boeing Computer Services, Seattle	April 9-13, 1990, Toronto	Two meetings per year; two newsletters a year.	Gunter Georgi, secretary (516)-575-2855

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Credit Management Systems 1777 North Kent Street, Arlington, VA 22209 (703)-841-6404							
None	1,300/ 350	American Management Systems	Software and services to support full credit cycle management from origination through loan servicing to collections.	Barb Goodin, Bank of Nova Scotia	May 5-8, 1991; Hilton Head, S.C.	One user conference every 18 months; newsletter	Betsy Sullivan, coordinator (703)-841-6404
CUBE Inc. P.O. Box 33053, Detroit, MI 48232 (313)-972-8698							
None	3,700/ 1,500	Unisys	All Unisys products	Gene Roman, Systems Design Corp., Chicago	April 17-20, 1990, Dallas	Two national meetings per year; newsletter	CUBE office (313)-972-8698
CUE North America 312 Captain's Walk, Box 13, New London, CT 06320 (203)-443-2883							
$400	None/ 427	Cadam	All Cadam software	Rosemary Russo, McDonald's Corp., Oakbrook, Ill.	March 12-15, 1990, Denver	Two national meetings per year.	CUE North America (203)-443-2883
Cyborg Users Association 3111 North Des Plaines Street, Suite 608, Chicago, IL 60606 (312)-454-0984							
$100 per company	933/ 311	Cyborg Systems	All Cyborg Systems software	Bob Sarlous, Florida Power	April 1990 San Antonio	Two conferences a year; annual skills manual of members	Peter Struthers (312)-454-0984
Datacom/Ideal Midwest Regional Users Group c/o Jim Newman, American National Bank & Trust Co. of Chicago 33 North Lasalle Street, Chicago, IL 60690 (312)-661-6854							
None	None/ 75	Computer Associates International		Jim Newman, American National Bank & Trust Co. of Chicago	1st Wednesday of Feb., May, Aug., Nov.	Annual conference; new product presentations; workshops; user experience case studies; corporate profiles; software exchange	Jim Newman, chairman (312)-661-6854
Datapac User Group (DUG) P.O. Box 1049, Station B, Ottawa, Ontario K1P 5R1 Canada; outside Canada (613)-781-0240, inside Canada (800)-267-6674							
$50	350/ 10	Telecom Canada	Datapac products	David Burnett, Netway Communications, Toronto	Nov. 1990, Toronto	Three conferences a year; newsletter	Michelle Roy, coordinator (613)-727-0300
Digital Equipment Computer Users Society (DECUS) 219 Boston Post Road, BPO2 Marlborough, MA 01752 (508)-480-3635							
None	U.S.: 50,000 World: 120,000/ None	Digital Equipment	All Digital products	Bill Brindley, HDQ, Naval Security Group Command,- Washington, D.C. President, DECUS U.S. Chapter)	May 6-11, 1990, New Orleans	Two national symposia per year; 20 special interest groups; 160 local users groups; monthly technical newsletter; electronic conferencing; seminars	Mary Oskirko, coordinator (508)-480-3259
DMS/OS User Group 11050 White Rock Road, Rancho Cordova, CA 95670 (916)-636-1304							
None	NA 300	Sterling Software	Storage management products	Robin Macfarland, Mutual Benefit Life, Newark, N.J.	April 29-May 2, 1990 Anaheim, Calif.	One meeting per year	Kim Hughes, coordinator (916)-636-1304
DocuGroup 5910 North Central Expressway, Suite 800, Dallas, TX 75026 (214)-891-6500							
None	225/ 80	Image Sciences	All Image Sciences products	Muriel Hogan, Image Sciences	Sept. 1990, Dallas	One national meeting a year	Muriel Hogan, coordinator (214)-891-6500
Dylogue 9340 Owensmouth Avenue, P.O. Box 2210, Chatsworth, CA 91313 (818)-718-8877							
None	200-300/ NA	Sterling Software, Dylakor Div.	All Dylakor products	None	April 29-May 2, 1990 Anaheim, Calif.	One meeting per year	Debbie McCain (818)-718-8877

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
EDGE International 19011 West Valley Highway, Suite A 105C, Kent, WA 98032 (206)-251-6010							
$300	275/ 225	Multiple	Xerox systems and Xerox-compatible systems.	Karen Alligier, Boeing Military Airplane Div., Wichita, Kan.	May 1990, Cherry Hill, N.J.	Two national meetings per year; periodic newsletters and other publications.	EDGE headquarters (206)-251-6010
EDV-Anwenderkreis e.V. (EAK) P.O. Box 31, 6992 Weikersheim, West Germany (49)-7934-8911							
180 DM	327/ 323	Nixdorf Computer	Nixdorf systems 8810, 8840,8860, and 8870 Quatro, 8890; standard software Nixdorf COMET TOP; Nixdorf vertical market software	Ruediger Brand	To be announced	Consulting	EAK (49)-7934-8911
Encore Users Group 6901 West Sunrise Boulevard, Ft. Lauderdale, FL 33310 (305)-797-5423							
None	1,951/ None	Encore Computer	All Encore products	Ron Kirkpatrick, GE Government Services, Melbourne, Fla.	May 1990, Amsterdam, the Netherlands	Two meetings per year; periodic newsletters	Arlene Kehrer, coordinator (305)-797-5423
European Control Data Users (ECODU) Barer Strasse 21, D-8000, Munich 2, West Germany, (49)-89-2105-7408							
200 Sfr	NA/ 151	Control Data	Large mainframes for scientific, technical and database applications; sophisticated operating systems and networks; high-performance workstations.	Dietz Schubring, Leiniz Rechenzentrum, Munich, West Germany	May 14-18, 1990, Amsterdam, the Netherlands	Two national meetings per year; bimonthly newsletter	Eric Luijf, secretary (31)-70-264-221 ext. 588
European UNIX Systems Users Group (EUUG) (an umbrella organization for 14 national European UNIX Systems Users Groups) Owles Hall, Buntingford, Hertford, SG9 9PL, U.K. (44)-763-73039							
*	3,500/ 0	AT&T UNIX Europe	All UNIX products	Teus Hagen, OCE, the Netherlands	April 23-27, 1990, Munich West Germany	Two international conferences per year; periodic workshops and tutorials; quarterly newsletters	Mrs. H. Gibbons, business manager (44)-763-73039
FACOM Family Kai 6-1 Marunouchi 1-chome, Tokyo 100, Japan (81)-3-216-3211							
24,000 Yen	None/ 4,180	Fujitsu	All Fujitsu computers	Hideo Watanabe, Mitsubishi Kasei Corp.	May 1990, Tokyo	One national meeting per year; periodic newsletters and other publications	FACOM Family Kai (81)-3-216-3211
Federation of NCR User Groups (FNUG) (with 35 member user groups) 5008 Pine Creek Drive, Westerville, OH 43081 (614)-895-1280							
$100 per group	NA/ 4,000	NCR	All NCR products	Robert E. Richter, Baker Mfg. Co., Evansville, Wis.	April 29-May 2 Reno	One user conference and one technical seminar annually; quarterly newsletter	Beverly Kerins, administrator (614)-895-1280
Federation of RAMIS Users and Managers International Inc. (FORUM International Inc.) 401 Dogwood Circle, Norcross, GA 30071 (404)-586-8664							
None	1,400/ 0	On-Line Software International	RAMIS Information Systems and RAMIS/PC Workstations	Robert C. Forhetz Monsanto Co., St. Louis	Oct. 1990; Nashville	One meeting per year	Craig Marsteller, secretary (404)-586-8664
Fieldwatch Users' Group (FUG) c/o Siemens Medical Systems Inc., 186 Wood Ave. South, Iselin, NJ 08830 (201)-321-4913							
None	350+/ 0	The Data Group	Fieldwatch software modules and add-ons for IBM, VAX, HP mainframes.	Ron Sworen, Siemens Medical Systems, Iselin, N.J.	April 1990	Two meetings per year provide forum for testing "what-if" scenarios with other field service professionals-	Ron Sworen (201)-321-4913
Financial Management Special Interest Group (FINSIG) 1400 53rd Street, Emeryville, CA 94608 (415)-420-4780							
None	NA/ 50	Cincom Systems	CONTROL: Manufacturing software in both the IBM and DEC environments	Susan Swank, Cetus Corp. Emeryville, Calif.	To be announced	Periodic meetings and newsletters	Susan Swank, (415)-420-4780

* Non-European users only: L40, individuals; L100, corporate.

1990 INTERNATIONAL USER GROUP DIRECTORY

Fox Valley Technical College PC User Group
P O Box 2277 - Mail Room 318, Appleton, WI 54913 (414)-735-2470

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$15	145/ 0	Multiple	All types of PCs	Steve Erbach	Jan. 18, 1990 (Group meets every third Thursday of the month except December)	11 meetings a year; monthly newsletter	Judith Brown, secretary (414)-735-2470; or Cindy Kane, group member (414)-735-2414

Fujitsu Large Systems Users Group (LS-ken)
17-25 Shin-Kamata, 1-chome Ota-ku, Tokyo 144 Japan (81)-3-735-1111

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
30,000 Yen	None/ 266	Fujitsu	Fujitsu systems larger than M-360 or M-760/8	Padao Ito, Toray Systems Center Inc.	June 13-14, 1990, Tokyo	One national meeting per year; quarterly newsletter	Morito Yamamoto, LS-ken promotion officer (81)-3-735-1111

Fujitsu Scientific Systems Users Association (SS-ken)
17-25 Shin-Kamata, 1-chome Ota-ku, Tokyo 144 Japan (81)-3-735-1111

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
20,000 Yen	2/ 59	Fujitsu	Large-scale FACOM computers	Makoto Nagao, Kyoto University	May 1990, Tokyo	Meetings held on specific subjects; periodic newsletters	Morito Yamamoto, LS-ken promotion officer (81)-3-735-1111

Fuse Inc. - The Focus Users Group (FUSE)
450 Seventh Avenue, Suite 509, New York, NY 10123 (212)-967-6521

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	6,000/ 0	Information Builders Inc.	FOCUS products	Larry Braun, 3M, St. Paul	June 3-8, 1990, Boston	One annual meeting; quarterly newsletters;	FUSE office (212)-967-6521

Global Software User Group Inc.
P O Box 51248, Raleigh, NC 27615 (800)-334-7192

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	NA/ 2,000	Global Software	All financial software packages sold by Global	Vicki Wallup, Mead Corp., Dayton, Ohio	Aug. 26-29, 1990, San Diego	One annual meeting; quarterly newsletter	John Alis, liaison (800)-334-7192

Government Systems Users Group (GSUS)
1777 North Kent Street, Arlington, VA 22209 (703)-841-6000

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	163 sites/ 0	American Management Systems	State and local government and district financial products.	John E. Cronise, Multnomah County, Ore.	Sept. 9-12, 1990, Baltimore, Md.	One national meeting per year; quarterly newsletter; various regional meetings throughout year.	Dorothy Cotman, coordinator (703)-841-6000

GroupFacts Advisory Board
1700 Broadway, New York, NY 10019 (212)-765-8500

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	NA/ 30	Erisco	GroupFacts on-line group life and health administration system	Joseph Fields, Rural Security Life Insurance Co., Madison, Wis.	March 1990, New York City	One annual conference	Marcie Cohen, liaison (212)-765-8500

GrowthPower User Group
1 Burlington Woods Burlington, MA 01803 (617)-229-2200

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
0	NA/ 422	Computer Solutions	GrowthPower software and HP hardware	NA	Nov. 12-14, 1990, Orlando, Fla.	NA	Kathy Quigley, coordinator (617)-229-2200

GUIDE International Corp. (guidance for users of Integrated Data-Processing Equipment Inc., GUIDE)
111 East Wacker Drive, Chicago, IL 60601 (312)-644-6610

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$500	None/ 2,850	IBM	3090, 3080, 9370, AS/400 series	Gary S. Gesme, Deere & Co., Moline, Ill.	March 11-16, 1990, San Francisco	Three national meetings per year; biannual executive symposia; newsletters and other project publications	John Sherman, account executive (312)-644-6610

GUIDE Switzerland
c/o Schindler Informatik AG, CH-6030 Ebikon, Switzerland (41)-41-33-28-27

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
SFr 600	NA/ 2,200	IBM	All IBM System/370 architecture and top end AS/400 products	Pierre Delesalle, Gemeentekrediet van Belgie, Brussels, Belgium	May 29-June 1, 1990	Two international conferences per year; newsletters; technical bulletins	Schindler Informatik (41)-41-33-28-27

Heath/Zenith Users Group (HUG)(an umbrella organization with more than 100 local user groups under it)
P O Box 217, Benton Harbor, MI 49022 (616)-982-3463

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$22.95 first year	17,000/ None	Zenith Electronics	Heath and Zenith computers	Margaret Bacon, Heath	HUG has no meetings, but local user groups do.	Monthly magazine	HUG office (616)-982-3463

1990 INTERNATIONAL USER GROUP DIRECTORY

HITAC Users' Association
Hitachi Omori Annex #2, 27-18, Minami-Oi 6-chome, Shinagawa-ku, Tokyo 140, Japan (81)-3-763-2411 (ext. 3201-3205)

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
24,000 Yen	NA/ 1,780	Hitachi	All Hitachi computer systems	Kenzo Sakai, Shoko Chukin Bank	June 1990, Tokyo	One national meeting annually; magazine and research papers	Kazuya Hanazuka, public relations Hitachi (81)-3-763-2411

HLSUA-U.S.
4000 Town Center, 8th Floor, Southfield, MI 48075 (313)-351-4677

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$325	None/ 450	Bull NV	All Bull products (predominantly medium and large systems)	William C. McCusker, Citrus Community College, Glendora, Calif.	March 25-28, 1990 Cincinnati	Two national meetings per year; semiannual newsletter	HLSUA-U.S. (313)-351-4677

HUG (Hogan User Group) International Inc.
5008 Pine Creek Drive, Westerville, OH 43081 (614)-895-1362

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$400	None/ 110	Hogan Systems	Hogan systems software and IBM financial application software	John Meyer, Society National Bank, Cleveland	April 23-26, 1990 San Diego	One annual meeting; quarterly journal	Jim Bannister, exec. director (614)-895-1362

ICL Computer Users Association (ICLCUA) (an umbrella organization for 40 separate user groups)
P.O. Box 42, Bracknell, Berkshire RG12 2LQ U.K. (44)-3-44-482933

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
0	4,000/ same	ICL	All ICL products from Series 39 to DRS distributed systems	Ken Wingfield Doncaster MBC Doncaster, U.K.	May 30-June 1, 1990, Birmingham, U.K.	One major association conference per year; meetings four times per year of each member user group; periodic management and technical seminars, conferences and exhibitions; quarterly magazine	C.H. Devonald secretary (44)-3-44-482933

IDMS User Association (IUA)
111 East Wacker Drive, Suite 600, Chicago, IL 60601 (312)-644-6610

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	NA/ 1,800	Computer Associates	IDMS-related products	Richard Lenz, Wisconsin Gas Co., Milwaukee	March 18-22, 1990, Seattle	One annual meeting; quarterly newsletter; user-contributed library.	Ann VerMeulen, administrator (312)-644-6610

ImpleFacts Advisory Board
1700 Broadway New York, NY 10019 (212)-765-8500

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	NA/ 74	Erisco	ImpleFacts defined contribution record-keeping system	Gary Grammer, Mercantile Bank NA, St. Louis	March 1990, New York City	One annual conference	Marcie Cohen, liaison (212)-765-8500

Information Dimensions Exchange Association (IDEA)
655 Metro Place South, Dublin, OH 43017 (614)-761-8083

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$25	450/ 0	Information Dimensions	BASIS, BASIS/IMAGES, TECHLIB/ STACS, DM	Bob Brayton, Rockwell International, Seal Beach, Calif.	March 1990, Columbus, Ohio	User information exchange service; meetings twice a year	Jane Snider, IDEA secretary (614)-761-8083

Integrated Hospital System Users Group (IHSUG)
600 McDonnell Boulevard, Hazelwood, MO 63042 (314)-233-9330

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
$100	None/ 36	American Express Information Services, Health Systems Group	Integrated financial and clinical systems	Ed Merkle, Elmbrook Memorial Hospital, Brookfield, Wis.	March 12-14, 1990, New Orleans	Two national meetings per year; bimonthly newsletter	Ed Merkle, president (414)-785-2000

IntelliCorp Users Group (IC UG)
1975 El Camino Real West, Mountain View, CA 94040 (415)-965-5500

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	250/ 0*	IntelliCorp	All IntelliCorp software products	Thomas B. Helfaker, IntelliCorp Mountain View, Calif.	Feb. 28-March 2, 1990, Burlingame Calif.	One annual national meeting and various regional meetings	Ed Hoffman, IntelliCorp (415)-965-5665

Interact (an umbrella organization for 9 regional and industry-specific groups in the U.S., as well as several foreign groups)
3445 Peachtree Road N.E., Atlanta, GA 30326 (404)-239-2506

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
None	NA/ 7,500	Management Science America	All MSA software	Rick Lippincott Geisinger System Services, Danville, Pa.	April 22-26, 1990, Atlanta	Several international meetings, one national meeting; 9 regional or industry-specific meetings a year; quarterly publications	Kerry Coxworth, manager (404)-239-2506

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Interchange Inc. 106 Apple Street, Tinton Falls, NJ 07724 (201)-758-7575							
$50 single; $150 group	1,600/ None	Concurrent Computer	Interdata, Perkin-Elmer, Masscomp and Concurrent systems	Pete Massiello, Perkin-Elmer Corp., Norwalk, Conn.	Oct. 1990, St. Louis	One national meeting per year; quarterly newsletter; three software catalog libraries; electronic bulletin board	Patricia Brown, administrator (201)-758-7575
Interex Inc. - The International Association of HP Computer Users P O Box 3439, 585 Maude Court, Sunnyvale, CA 94088 (408)-738-4848							
$80 Indiv.; $400 Corp.	9,000/ 5,600	Hewlett-Packard	All HP computer products	Robert Grenoble, president, Interex	April 12-14, 1990, Las Vegas	Two major domestic conferences and one European conference a year; two monthly magazines and one monthly newsletter; quarterly newsletter	Maria Afanasiev, supervisor (408)-738-4848
Internally Switched Interface System (ISIS) for International Tymnet Users 2560 North First Street, San Jose, CA 95161 (408)-922-7534							
None	50	McDonnell Douglas Network Systems	Private network systems and managed data network services	Bob Barbour, McDonnell Douglas	May 1990	Two international and one domestic meetings per year	Bob Barbour (408)-922-7534
International Databus Users Group (IDUG) 13663 Jupiter Road, Suite 404 Dallas, TX 75238 (214)-340-6800							
$36 for newsletter	200/ None	Multiple	Databus	Mike Shaffer Savant Technologies Inc. Dallas	Feb. 1990, Dallas	Yearly meeting, newsletter, electronic bulletin board system	Mike Shaffer (214)-340-6800 BBS (214)-340-6824
International Data 3 Users Group (IDIG) P O Box 441, Santa Rosa, CA 95402 (707)-528-6560							
None	NA/ 550	ASK Computer Systems, Data 3 Division	IBM AS/400 and IBM S/38 and Data 3 software	John McGuire, Picker International, Highland Heights, Ohio	Sept. 1990, San Francisco	One annual meeting	Victor Kunkel, liaison (707)-528-6560
International DB2 Users Group (IDUG) 111 East Wacker Drive, Suite 600, Chicago, IL 60601 (312)-644-6610							
None; vendor pays $500 per year or $2,500 for life	700/ None	Multiple	DB2	William Backs, Scott, Foresman and Co. Glenview, Ill.	May 13-17, 1990, Chicago	One annual conference; quarterly newsletters	Jack Thompson, director of administration and conferences (312)-644-6610
International Intergraph Graphics Users Group (IIGUG) (an umbrella organization for national user groups) 1 Madison Industrial Park, Mailstop IW 2001, Huntsville, AL 35807 (205)-772-2292							
None	16,000/ 6,000	Intergraph	All Intergraph hardware and software	Ray Bober, Ebasco, New York City	May 6-10, 1990, Huntsville, Ala.	One international and one U.S. meeting per year; several meetings in foreign countries; periodic newsletters.	IIGUG (205)-772-2292
International Model 204 Users Group Box 966, Cambridge, MA 02142 (617)-661-6204							
$500	1,600/ NA	Computer Corp. of America	Model 204 RDBMS, SQL and related products	Eric Adler, A.C. Nielsen, Dunedin, Fla.	May 6-11, 1990, San Diego	Annual conference, quarterly newsletter, regional groups and special/functional groups.	Debbie McDonald, administrator (617)-661-6204
International Society of Wang Users (ISWU) 1 Industrial Avenue, MS 019-32B, Lowell, MA 01851 (508)-967-4322							
$10	7,000/ None	Wang Laboratories	All Wang products	None	Feb. 5-6, 1990, Lowell, Mass.	Four meetings per year; monthly publication	ISWU office (508)-967-4322

1990 INTERNATIONAL USER GROUP DIRECTORY

nual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
International Software AG Users Group (SAGGROUP) 11190 Sunrise Valley Drive, Reston, VA 22091 (703)-860-5050							
[illegible]	NA/ 3,500	Software AG	All Software AG products	Bill Wagner, University of Texas, Austin, Texas	Nov. 4-8, 1990, San Antonio	One or two international meetings annually; quarterly newsletter	Larry Jayne, member of exec. committee (703)-860-5050
International Tandem Users' Group (ITUG) 111 East Wacker Drive, Suite 1000, Chicago, IL 60601 (312)-565-4689							
[illegible]	2,600/ 900	Tandem Computers	All Tandem products	Steven Moriarty, Expressway, Los Gatos, Calif.	May 13-16, 1990, London	Two international meetings per year; bimonthly journal	Alison Powers, public relations manager (312)-565-4689
Japan Unisys Users Association (JUUA) Nihon Unisys Ltd., 17-51, Akasaka 2-chome, Minato-ku, Tokyo 107 Japan (81)-03-5485-4400							
[illegible]	None/ 1,300	Nihon Unisys	Unisys series 2200/1100, A/V series mainframe	Kazuo Konishi, president, JUUA	May 21, 1990, Tokyo	Two conferences a year; monthly technical publicctions; two technical reports a year	JUUA general secretary (81)-03-5485-4400
Just-in-Time Special Interest Group (JITSIG) 3600 Pammel Creek Road, LaCrosse, WI 54601 (608)-787-3615							
[illegible]	25/ 20	Cincom Systems	CONTROL: Manufacturing software in both IBM and DEC environments	Bill Jaekel, The Trane Co., LaCrosse, Wis.	NA	Periodic newsletters and meetings	Bill Jaekel, chairman (608)-787-3615
Key Accounts Program (KAP) 14101 Myford Road, Tustin, CA 92680 (714)-730-2698							
[illegible]	1,000/ 500	MAI Basic Four	All MAI Basic Four products	Bernard Jubb, MAI Basic Four	April 1990, Palm Springs, Calif.	One national meeting; quarterly newsletters	Bernard Jubb, director of community services (714)-730-2698
LEVEL5 Expert System/PRL Users Group (USERS.PRL) P.O. Box 312, Ramsey, NJ 07446 (201)-307-7866							
[illegible]	25,000/ NA	Information Builders	LEVEL5 software	Gary Ribar, Peat Marwick Main & Co., Ramsey, N.J.	Nov. 1990, Cocoa Beach, Fla.	One annual meeting; two local chapters hold monthly or bimonthly meetings	Gary Ribar, president (201)-307-7866
Lotus* User Group Program, 55 Cambridge Parkway, Cambridge, MA 02142 (617)-577-8500							
[illegible]	NA/ 0	Lotus	All Lotus software products	NA	NA	Quarterly newsletter	Sandra Marcus, manager (617)-577-8500
MAS User Group 6201 South Freeway, Ft. Worth, TX 76134 (817)-551-4004							
[illegible]	None/ 15	None (formerly Martin Marietta)	All MAS software	Larry Cram, Star Technologies Inc.	NA	Two national meetings per year; periodic newsletters	Juan Vela (817)-293-0450
Maximo User Group (MUG) 20 University Road, Cambridge, MA 02138 (617)-661-1444							
[illegible]	750/ 0	Project Software & Development	Maximo Maintenance Systems running on DOS	NA	Aug. 1990, Cambridge, Mass.	One annual meeting	Rob Bloom, coordinator (617)-661-1444
MBF National Users Group (MBFNUG) P.O. Box 124, Union City, GA 30291 (800)-241-7345							
[illegible]	1,100/ 800	MAI Basic Four	All MAI Basic Four products	George Miller, Cleveland Group Inc., Atlanta	To be announced	One national conference per year; newsletters; educational services	Phil Basler, liaison (714)-730-2698
McCormack & Dodge User Group USA (an umbrella organization with member groups organized by product, industry or region) 1225 Worcester Road, Natick, MA 01760 (508)-650-2311							
[illegible]	All customers	McCormack & Dodge	Financial, human resource, software & tools.	NA	June 17-20, 1990, San Francisco	One annual conference; regional and special interest meetings; quarterly magazine	Jane Mackin, manager of customer relations (508)-650-2311

* Information on 30 nationwide user groups

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
McCormack & Dodge User Group U.K. P.O. Box 273, Kings House, Bond Street, Bristol BS99 7AL U.K. (44)-272-276-866							
None	All U.K. users	McCormack & Dodge U.K.	Financial and tools software	NA	Sept. 1990,	One conference; quarterly magazine	Janet Withall (44)-272-276-866
Management Systems Conference (MSC) 10505 Sorrento Valley Road, San Diego, CA 92121 (619)-452-0170							
To be determined	NA/ NA	Computer Associates International	Financial, accounting, distribution and decision support software	NA	Sept. 16-20, 1990, Orlando, Fla.	One meeting per year	MSC office (619)-452-0170
MHS Users Group 600 McDonnell Boulevard, Hazelwood, MO 63042 (314)-233-9330							
0	None/ 75	American Express Information Services Co. Health Systems Group	Integrated financial systems	Don Kalb, Galion Community Hospital, Galion, Ohio	April 1990	Two meetings per year	Don Kalb, president (419)-468-4841
Microsoft (Company acts as an umbrella for : 1 Microsoft Way, Redmond, WA 98052 (206)-882-8080							
0	NA/ NA	Microsoft	All Microsoft software packages	Mimi Getchell, Microsoft Corp., Redmond, Wa.	NA	Provides information on nationwide user groups	Tonya Dressel, coordinator (206)-882-8080
MICRU International 1732 Montane Drive East, Golden, CO 80401 (303)-526-9862							
$50	650/ 150	McDonnell Douglas Computer Systems	McDonnell Douglas series 6000; 9200; series 18; series 7000	Herb Jackson	Sept. 5-8, 1990, San Francisco	One national educational conference per year; periodic newsletters	Herb Jackson, president (303)-526-9862
MISER Users Group Inc. (MUG) 5008 Pine Creek Drive, Westerville, OH 43081 (614)-899-6301							
$400	None/ 151	The Newtrend Group	MISER financial software package	Robert Wilson, Dryades Savings & Loan, Metairie, La.	May 9-11, 1990, Lake Buena Vista, Fla.	One annual meeting; quarterly newsletter	Betty Hindes, asst. exec. dir. (614)-899-6301
Motorola Computer Systems Users Group Purdue University, Lafayette, IN 47907 (317)-494-6147							
None	150-200/ 20	Motorola Computer Systems	All products	Dan Kinder, Purdue University	May or June 1990, Schaumburg, Ill. Lafayette, Ind.	One annual meeting	Dan Kinder, president (317)-494-6147
MT User Group (MUG) Chuo Building No. 22, 2-11-8 Ginza, Chuo-ku, Tokyo 104, Japan (03)-546-2705							
5,000 Yen indiv.; 20,000 Yen corp.	3,000/ 100	Ricoh Co.	Ricoh personal computers	Haruo Ushio, Ushio Electronic Co.	NA	Quarterly newsletter	NA
NAHU, an Association of Bull Users P.O. Box 2037, Willingboro, NJ 08046 (609)-429-0775							
$125	None/ 468	Bull HN Info Systems	DPS 4, 6, 7/7000, Level 6, Level 62/64; DPS 8; and microproducts	Shirley Eick, Metropolitan Life Inc., New York, City	March 25-28, 1990, Cincinnati	Two national meetings per year; regional groups; educational seminars	Les Pacca, exec. director (609)-429-0775
Nantucket (over 60 local and regional groups worldwide) 12555 W. Jefferson Boulevard, Los Angeles, CA 90066 (213)-390-7923							
by group	NA/ NA	Nantucket	Clipper database development system for PCs and compatibles	NA	NA	Provides information on over 60 user groups	Natalie McNeal, coordinator (213)-390-7923
National Datapoint Users Group (NDUG) P.O. Box 9197, Arlington, VA 22209 (703)-841-8515							
$50	150/ NA	Datapoint	All Datapoint products and non-Datapoint products that connect to and serve Datapoint's ARCnet	Sue Farni, City of Mobile, Mobile, Ala.	June 1990, San Antonio	One annual meeting	Sue Farni, president (205)-434-7830

1990 INTERNATIONAL USER GROUP DIRECTORY

ational Epson Users Group (NEUG) (with approximately 30 local user groups throughout the country)
.O. Box 1076, Lemont, PA 16851 (814)-237-5511

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
25	2,400/ None	Multiple	QX-10, QX-16 and Equity line of Epson computers; Epson line of printers; also supports WordStar, Venture Desktop publishing and most public domain and SHAREware	Richard Shoemaker, NEUG, Lemont, Pa.	March 9-11, 1990, State College, Pa.	One meeting a year; monthly newsletter; electronic bulletin board	Richard Shoemaker (814)-237-5511

he National Prime Users Group Inc. (NPUG)
.O. Box 697, Laurel, MD 20707 (301)-490-2056

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
25	2,500/ None	Prime Computer	All Prime systems	John H. Steffen St. Louis St. Louis	June 3-8, 1990, Orlando, Fla.	One national meeting per year; bimonthly newsletter	Judy Cook, exec. sec. (301)-490-2056

etWare Users International (NUI)
22 East 1700 South, Mail Stop C-11-1, Provo, UT 84606 (801)-379-7784

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
y hap- er	50,000/ 25	Novell	NetWare operating system and its compatible products	Greg Drusdow, ACORD White Plains, N.Y.	Feb. 1990 Boston	Two international meetings per year; 180 local chapter meetings worldwide; monthly newsletter	Dan J. Payton manager, group administration (801)-379-7784

etwork Management Users Group
North 9th Street, Allentown, PA 18101 (215)-770-4436

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
one	50/ NA	Cincom Systems	Net/Master, Info/Master Network tracking system, MAI	Bob Gotthardt, Pennsylvania Power & Light, Allentown, Pa.	Spring 1990	Two meetings per year; quarterly newsletter	Bob Gotthardt (215)-770-4436

etwork Systems Corp. Users (NEXUS)
600 Boone Avenue North, Brooklyn Park, MN 55428 (612)-424-1680

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
one	None/ 344	Network Systems	All NSC products, including HYPERchannel, HYPERbus, Remote Device Subsystem (RDS) hardware and NETEX sc[illegible]	Robert V. Ferrara, Raytheon Co., Andover, Mass.	Sept. 11-14, 1990, Orlando, Fla.	Two annual meetings; newsletter	Robert Ferrara, president (508)-470-5377

etwork Users Group--AT&T (NUGATT[illegible]
.O. Box 1453, Peoria, IL 61655 (309)-6[illegible]

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
100	130/ 130	AT&T	AT&T local [illegible] data communications	Stephen Patrick, Bradley University, Peoria, Ill.	June 1990, Philadelphia	Two national meetings a year; quarterly newsletter; electronic mail and bulletin board	Stephen Patrick (309)-677-2949

ew York Amateur Computer Club (NYACC)
.O. Box 3442, Church Street Station, New York, NY 10008 (Phone NA)

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
20	400/ None	Multiple	MS-DOS,UNIX,OS/2, CP/M and others	Steve Walton, president	Jan. 1990	Monthly meetings; 12 special interest groups with monthly meetings; monthly newsletters	NA

ew York IBM Users Group (NYPC)
0 Wall Street, Suite 2124, New York, NY 10005 (212)-533-NYPC

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
25	3,000/ None	Multiple	MS-DOS,OS/2,UNIX	David Hoffman	Jan. 1990	Monthly meetings; 50 special interest groups; monthly newsletters; two bulletin boards	NYPC (212)-533-NYPC

New York Macintosh Users Group (NYMUG)
P.O. Box 2269, New York, NY 10116 (212)-691-0496

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
32	1,500/ None	Apple	Macintosh and related products	Sonya Brockstein	Jan. 1990	Monthly meetings; monthly newsletters	(212)-691-0496

Norsk Computer Users Society (NOCUS)
P.O. Box 44, Bogerud, 0621 Oslo 6, Norway (47)-262-8000

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
NKr 1,000	None/ 600	Norsk Data	All Norsk Data and Norsk Data-related products	Janett South, Statoil, Stavanger, Norway	Feb. 6-7, 1990, Copenhagen	Four conferences a year; quarterly newsletter	General Secretary, NOCUS (47)-262-8000

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Key Officer	Next Meeting	Services Provided	Contact
North American Data General Users Group (NADGUG) Suite 3150, 4807 Spicewood Springs Road, Austin, TX 78759 (800)-877-4787; outside U.S.: (512)-345-5316							
$40	3,032/ None	Data General	All DG products	Les Jones, Gulf Coast Systems, Houston	Oct. 22-25, 1990, Seattle	One national conference per year; monthly magazine; software library; access to regional and special interest groups	Jennifer Foye, membership coordinator (512)-345-5316
North American INGRES Users Association (NAIUA) 1080 Marina Village Parkway, Alameda, CA 94501 (415)-748-3402							
None	4,000/ NA	Relational Technology	INGRES and its related family of RDBMS software products	Betty Stokes, DataBase Developers	May 6-10, 1990, Salt Lake City	Annual meeting; quarterly newsletter	Alan B. Hayes, chairperson (801)-582-5847, ext. 6863
North American NCR Financial Users Group (NANCRFUG) 5008 Pine Creek Drive, Suite B, Westerville, OH 43081 (614)-895-1280							
$150	None/ 275	NCR	NCR equipment and NCR financial software	Dennis Reedy, 1 Financial Place Knoxville, Tenn.	Oct. 7-10, 1990, Baltimore	Two annual meetings; quarterly journal	Beverly Kaims, asst. exec. dir. (614)-895-1280
Nuclear Data Users' Group (NDUG) Golf and Meacham Roads, Schaumburg, IL 60196 (312)-884-3600							
None	150/ None	Nuclear Data	VAX and PC-based computer systems and software for analyzing radiation	Marianne Davidson, Nuclear Data Schaumburg, Ill.	April 1990	Biennual national meetings	Marianne Davidson (312)-884-3613
OASIS Computer Software Group P.O. Box 359, Norwalk, CT 06856 (203)-845-5141							
$50 to $250	250/ 250	Must Software International	NOMAD software products	Mike Adel, Industrial Indemnity, San Francisco	May 20-24, 1990, Nashville	One annual meeting; quarterly newsletter	Barbara Gomez, (203)-845-5141
OASIS Users Group 1777 North Kent Street, Arlington, VA 22209 (703)-841-6000							
None	20 sites/ NA	American Management Systems	OASIS software	Steve Patterson, Johnson County, Kan.	April 1-4, 1990, New Orleans	One annual meeting	Sue Wolfe, coordinator (703)-841-6000
PCS Users Group 600 McDonnell Boulevard, MO 63042 (314)-233-9330							
NA	None/ 30	American Express Information Services	Comprehensive clinical information systems for order capture and results reporting	Ray Shingler, Peninsula General Hospital, Salisbury, Md.	To be announced Cupertino, Calif.	Three meetings per year	Ray Shingler, president (301)-543-7300
PEISUG 40 Broad Street, Boston, MA 02109 (617)-350-7035							
None	500/ 400	Pilot Executive Software	EIS and DSS software packages	Mark Albala, American Cyanamid, Clifton, N.J.	Sept. 1990	One meeting per year; quarterly newsletters	Robin Donegan, manager of users group (617)-350-7035
Personnel Management User Group (SIP) V. le Eginardo 29, 20149 Milan, Italy (39)-2-49931							
$1,600	None/ 70	Data Management Milan	Data Management personnel management software packages	A. Pellegrini, Data Management, Milan	NA	Two conferences and two technical meetings per year; bimonthly newsletters	A. Pellegrini (39)-2-49931
Phoenix Software User Group 5933 West Century Boulevard, Suite 1200, Los Angeles, CA 90045 (213)-338-0400							
None	NA	Phoenix Software	All Phoenix software products	NA	March 27-30, 1990, Long Beach, Calif.	One meeting per year; quarterly newsletter	Elizabeth Greene, conference coordinator (213)-338-0400
Price Waterhouse Software Users Group 1410 North Westshore Boulevard, Tampa, FL 33607 (813)-287-9000							
None	750/ 250	Price Waterhouse	PW's proprietary accounting packages, PWS/FMS and PWS/IDEAS	Dan Soper	NA	One national meeting per year; newsletter	Priscilla Lewis, Price Waterhouse (813)-287-9000

1990 INTERNATIONAL USER GROUP DIRECTORY

Primavera Users Group
2 Bala Plaza, Bala Cynwyd, PA 19004 (215)-667-8600

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	9,500/ 7,500	Primavera Systems	Primavera software packages	Joel Koppelman, Primavera	To be announced	One annual national meeting; regional meetings; quarterly newsletter	Scott Deutsch, (215)-667-8600

Project Oriented Manufacturers Special Interest Group (PROSIG)
c/o Lucas Western, 2604 Highway 20 North, Jamestown, ND 58401 (701)-252-6250

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	25/ 16	Cincom Systems	CONTROL: Manufacturing in both the IBM and DEC environments	Gary Weinberger, c/o Lucas Western, Jamestown, N.D.	To be announced	Periodic meetings and newsletters	Gary Weinberger (701)-252-6250

Pyramid User Group (PUG)
1295 Charleston Road, Mountain View, CA 94043 (415)-965-7200

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
$100 org./ $25 indiv.	170/ 65	Pyramid Technology	All products	Cathy Beste, Robert Wood Johnson Foundation, Princeton, N.J.	Jan. 1990, Washington, D.C.	Semiannual meetings	Cathy Beste (609)-452-8701

Relational Users Group (RUG)
2700 South Quincy Street, Arlington, VA 22206 (703)-671-9500

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
$50	125/ NA	Cincom Systems	SUPRA	Chuck Gross, Tidewater Consultants, Arlington, Va.	Feb. 1990	Two meetings per year; newsletter	Chuck Gross (703)-671-9500

Research Triangle Area INGRES User's Association
P.O. Box 30754, Raleigh, NC 27622 (919)-787-8611

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	130/ None	Relational Technology	INGRES software	Jerry Helms	Feb. 1990, Raleigh, N.C.	Four to six meetings per year	Jerry Helms, spokesperson (919)-787-8611

Sacramento PC Users Group (SPCUG)
P.O. Box 162227, Sacramento, CA 95816 (916)-334-7780

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
$25	NA/ None	Multiple	All types of PCs	Rick Hellewell	Jan. 1990	Monthly meetings; monthly newsletters; special interest groups support local chapters	Milt Hull, vice president (916)-334-7780

SAS User Group International (SUGI) (an umbrella group for approximately 130 regional, local and corporate user groups)
SAS Circle, Box 8000, Cary, NC 27512 (919)-467-8000

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	NA/ NA	SAS Institute	SAS System, System 2000, Data Management System, C products and Neovisual software	Tony L. One, Squibb Corp. Princeton, N.J.	April 1-4, 1990, Nashville	One national meeting per year; quarterly news magazine	SUGI coordinator (919)-467-8000

Security and Audit Executive Committee
711 Stewart Avenue, Garden City, NY 11530 (516)-227-3300

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	NA/ 0	Computer Associates International	Top secret and ACF security systems	Abe Barkin, Blue Cross/Blue Shield of Illinois, George Latimer, EDS	July 8-12, 1990, Orlando, Fla.	One national meeting per year; periodic newsletters to local user groups on various security issues; user databases; enhancement tape	Corporate events (516)-227-3300

Sequent Users' Resource Forum (SURF)
15450 Southwest Koll Parkway, Beaverton, OR 97006 (503)-626-5700

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	200-250/ 0	Sequent Computer Systems	Sequent's line of Symmetry superminicomputers and related products and peripherals	NA	To be announced	One meeting per year; quarterly newsletter	Susan Linman, liaison (503)-626-5700

SHARE
111 East Wacker Drive, Suite 600, Chicago, IL 60601 (312)-822-0932

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
None	None/ 2,637	IBM	Complex IBM systems	Cecilia Cowles, Cornell University, Ithaca, N.Y.	March 4-9, 1990, Anaheim, Calif.	Four national meetings per year; newsletter	Pam Schur, public relations manager (312)-644-6610

Shared Medical Systems (SMS)
51 Valley Stream Parkway, Malvern, PA 19355 (215)-296-6300

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officers	Next Meeting	Services Provided	Contact
NA	None/ 250	Shared Medical Systems	Independence and Invision software packages	Ed McFall, Pitt County Memorial Hospital, Greenville, N.C.	April 4-6, 1990, Philadelphia	Two national meetings per year; periodic newsletters	Richard Tebockhorst (919)-966-2320

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
SHARE European Association (SEAS) 17, rue Pierres du Niton, 1207 Geneva, Switzerland (41)-22-35-40-66							
NA	450/ NA	IBM	Large-scale and midrange IBM machines	Sverre Jarp, CERN	To be announced	Two meetings a year; newsletter	SEAS (41)-22-35-40-66
Siemens-Informationstechnik Anwenderverein e.V. (SAVE) (West German Siemens user group) Otto-Hahn-Ring 6, 8000 Munich 83, West Germany (89)-636-45640, 44354, 45641							
700 DM	1,600/ 440	Siemens AG	Wide variety of general purpose computer systems; vector-processing systems; workstations; personal and office computers; WAN, LAN and private telecommunication systems	Heinz Brill	March 7-9, 1990, Karlsruhe, West Germany	Three meetings per year; three publications a year	Heinz Kuhnert, (89)-636-45640
Silicon Valley Computer Society (SVCS) 1330 South Bascom, Suite D, San Jose, CA 95128 (408)-286-1271							
$30	900/ None	Multiple	All that fall within the microcomputer arena	Kathy Kodak	Jan. 1990	Monthly meetings on second Tuesday; monthly newsletters; special interest groups	Kent Safford, exec. director (408)-286-1271
Softool Users Group P O Box 729, Goleta, CA 93116 (805)-683-5777							
None	NA 1,500	Softool Corp.	All Softool products	Dorothy Huffman, Jet Propulsion Laboratory, Pasadena, Calif.	April 30-May 2, 1990, Washington, D.C.	Annual meeting	Softool Users Group (805)-683-5777
SOTAS Users Group 262 North Delaware Avenue, North Massapequa, NY 11758 (212)-213-7674							
None	1,300/ 0	SOTAS International	SOTAS software packages for Wang VS and HP equipment	John Parisi	Sept. 16-19, 1990, St. Louis	One conference per year; semiannual newsletter	John Parisi, chairman (212)-213-7674
Special Interest Group for Medical Applications (SIGMA) 2550 Garcia Avenue, Mountain View, CA 94043 (415)-336-5561							
None	350/ 50	Sun Microsystems	Sun equipment for medical applications	Ken McCray, Sun MicroSystems Mountain View, Calif.	Jan. 1990, Northern Calif.	Two worldwide meetings per year; regional meetings; periodic newsletters	Claire Eurglunes, liaison (415)-336-5561
StorageTek Forum 2270 South 88th Street, MS4355, Louisville, CO 80028 (303)-673-4732							
None	188/ 126	Storage Technology	Large systems storage products	Dean Boissoneau, Southern New England Telephone Co., New Haven, Conn.	Fall 1990,	Annual meeting	Renae Clark, coordinator (303)-673-4732
STRATEGY P.O. Box 685, Boston, MA 02102 (508)-460-2010							
$200 voting or $20 assoc. member-	300/ NA	Stratus Computer	Stratus architecture	John Fisher, GTE Corp., Boston, Mass.	Oct. 21-24, 1990, Phoenix	One annual meeting; periodic newsletter	Celeste Mikitarian, coordinator (508)-460-2010
SUNnet 51 Valley Stream Parkway, Malvern, PA 19355 (215)-296-6300							
0	NA NA 0	Shared Medical Systems	FMS, ACTION, EXACT software	Dan Walsh, Mercy Catholic Medical Center, Philadelphia	March 1990	One national meeting per year	Dan Walsh (215)-237-4840
Sun User Group Inc. (SUG) 2550 Garcia Avenue, Mail Stop 10-16, Mountain View, CA 94043 (415)-336-4112							
$30 indiv.; $125 inst.	6,500/ NA	Sun Microsystems	All Sun products	William Toth, MIT, Cambridge, Mass.	Dec. 1989, San Jose	One annual worldwide conference and exhibition; monthly newsletter; local user group support center	Dave Howard, SUG office (415)-336-4112

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
System Administration Special Interest Group (SASIG) 5353 Highlands Drive, Jackson, MS 39206 (601)-987-5249							
None	61/45	Cincom Systems	CONTROL: Manufacturing software in both the IBM and DEC environments	Denice Laham, Vickers Inc., Jackson, Miss.	To be announced	Periodic meetings and newsletters	Denice Laham (601)-987-5249
Systems Center Users Group 1800 Alexander Bell Drive, Reston, VA 22091 (703)-264-8000							
None	NA/NA	Systems Center	VMCENTER II, Network DataMover, Relational Database products, Network Administration products	NA	June 3-6, 1990, Dallas	Annual meeting; quarterly newsletter	Richard Smith, coordinator (703)-264-8000
Systems Software Conference Executive Committee (SSC) 711 Stewart Avenue, Garden City, NY 11530 (516)-227-3300							
None	NA	Computer Associates International	All CA systems products	Ross Markley, Perpetual Savings	Aug. 19-24, 1990 St. Louis	One meeting per year	Caroline Schafer (516)-227-3300 ext. 7052
Tangent c/o Nexus Inc. 7700 Leesburg Pike, Suite 205, Falls Church, VA 22043 (703)-847-6644							
$100	None/240	Tandy Corp.	All Tandy computers	John Esak, Nexus Inc.	NA	One national meeting per year; four newsletters	John Esak (703)-847-6644
Texas Instruments Mini/Microcomputer Information Exchange (TIMIX) P.O. Box 201897, Austin, TX 78720 (512)-250-7151							
$40	None/6,000	Texas Instruments	All TI computer products	Rosemary Colgrove, TIMIX, Austin, Texas	April 1990 Dallas	One national meeting per year; monthly magazine	TIMIX office (512)-250-7151
Trax User Group (TUG) 10801 National Boulevard, Los Angeles, CA 90064 (213)-475-8729							
None	2,000/500	Trax Softworks	Trax software products and others that interface to Trax products	Leo Hoyt, Caltrans Sacramento, Calif.	Feb. 25-28, 1990, Long Beach, Calif.	One annual meeting; quarterly newsletter	Leslie Thomas, coordinator (213)-475-8729
Tymnet Happy Users Group (THUGS) 2560 North First Street, San Jose, CA 95161 (408)-922-7505							
$50	*/NA	McDonnell Douglas Network Systems	Tymnet-oriented network products	Edith Jeffrey, Chase Manhattan Bank, New York City	June 1990	One national meeting per year; quarterly newsletter; one magazine	Tony Agnelli, (408)-922-7505 or Bob Barbour (408)-922-7534
UFO-COBOL/XE International User Group P.O. Box 2392, Princeton, NJ 08540 (609)-799-6300							
None	1,200/0	On-Line Software International	UFO Productivity System and COBOL/XE	Stephanie Suttle, City of Newport News, VA	Sept. 1990, Nashville	One annual meeting; annual survey for product enhancements	Lisa Jones, user group secretary (800)-257-9523
Ungermann-Bass Users Group 3900 Freedom Circle, Santa Clara, CA 95052 (408)-562-7741							
$30	600/125	Ungermann-Bass	Ungermann-Bass network products	Lynn Goodhue, Smith College Northampton, Mass.	May 1990 Orlando, Fla.	Two meetings a year; newsletter twice a year	Amparo Lago, coordinator (408)-562-7741
Unisys Users Association (UUA) Woodside, Over Lane, Baslow, Bakewell, Derbyshire DE4 1RT U.K. (44)-24-688-3241							
Varies by equipment	None/1,700	Unisys	Complete Unisys product range	Roger Toms, Surrey County Council	April 30-May 4 1990, Vienna	Two conferences per year in Europe; *UUA Journal* published eight times per year; periodic special reports	UUA (44)-24-688-3241
USE Inc. Box 461, Bladensburg, MD 20710 (301)-699-9336							
$250 gen./ $650 vendors	None/700	Unisys	Unisys 1100/2200, 5000/6000/7000	James T. Ault III, Creighton University, Omaha, Neb.	April 23-27, 1990, Nashville	Two annual meetings; monthly newsletter	USE office (301)-699-9336

* Network customers become automatic members

1990 INTERNATIONAL USER GROUP DIRECTORY

Annual Fee	Individual/Corporate Membership	Vendor	Systems/Products	Top Officer	Next Meeting	Services Provided	Contact
Usenix Association 2560 9th Street, Berkeley, CA 94710 (415)-528-8649							
$40 indiv.; $125 educ.; $275 corp.	2,800/ indiv. 350 educ. inst. 275 corp.	UNIX and UNIX-like OS vendors	UNIX and similar operating systems and the C programming language	Alan G. Nemeth, Prime Computer Inc., Framingham, Mass.	Jan. 22-26, 1990, Washington, D.C.	Two meetings per year; bimonthly newsletter and quarterly journal	Usenix Assoc. (415)-528-8649
UserFacts Inc. 1700 Broadway, New York, NY 10019 (212)-765-8500							
$200	None/ 78	Erisco	ClaimFacts and CertiFacts health care management software	Allen Heilman, Central Benefits Mutual Insurance Co., Columbus	May 1990 Ft. Lauderdale, Fla.	One annual conference	Marcie Cohen, liaison (212)-765-8500
University UNIX System V Users Group (u3g) AT&T, 1776 on the Green, Morristown, NJ 07960 (800)-247-1212 (ext 585)							
None	600/ 280 Univs.	AT&T	UNIX System V environment	David Binko, Johns Hopkins Univ., Baltimore	March 21-23, 1990 San Francisco	One annual meeting; quarterly newsletter	Margaret Cekada, manager, univ. programs, AT&T (201)-898-6023
UniForum (formerly /usr/group) - with 20 affiliated groups, six in the United States and 14 overseas. 2901 Tasman Drive, Suite 201, Santa Clara, CA 95054 (408)-986-8840							
$100	5,600/ None	UNIX and UNIX-like OS vendors	All UNIX systems	Doug Michels, Santa Cruz Operation, Santa Cruz, Calif.	Jan. 23-27, 1990, Washington, D.C.	One annual meeting; biweekly newsletter and magazine; Unix products; updates on POSIX	UniForum office (408)-986-8840
Utility User Group 20 University Road, Cambridge, MA 02138 (617)-661-1444							
None	900/ 0	Project Software and Development	Project management software consisting of PROJECT/2 and QWIKNET Professional running on IBM MVS and DEC VMS and PC DOS environments, and APECS-8000 utilizing UNIX	Tony Catanese, Pennsylvania Electric Co., Johnstown, Pa.	Fall 1990	One annual meeting	Ron Wallace, coordinator (617)-661-1444
VIM-Australasia 8100 34th Avenue South, Minneapolis, MN 55440 (612)-853-5691							
None	NA 20	Control Data	All CDC products	Alan Bell, Univ. of Melbourne	NA	One annual meeting; bimonthly newsletter	Sharron Tryon, administrator (612)-853-5691
VIM Inc. 8100 34th Avenue South, Minneapolis, MN 55440 (612)-853-5691							
$100	NA 315	Control Data	All CDC products	Robert Kirkmen Combustion Engineering Windsor, Conn.	Jan. 14-17, 1990, San Antonio	Two national meetings and two interim meetings per year; bimonthly newsletter	Sharron Tryon, administrator (612)-863-5691
Washington DC Metro Area IDS User Group c/o Chris Cockrell, 3871 Wilcoxson Drive, Fairfax, VA 22031 (703)-978-4134							
0	237/ None	Computer Associates	CA's IDMS database management system	Chris Cockrell Fairfax, Va.	Jan. 26, 1990	Quarterly meetings	Chris Cockrell (703)-978-4134
Westchester PC Users Group (WPCUG) P.O. Box 349, White Plains, NY 10602 (914)-923-1337							
NA	500/ NA	Multiple	MS-DOS, OS/2, UNIX	Michael Friedman	Jan. 1990	Monthly meetings; monthly newsletters	WPCUG (914)-923-1337
XL/Group Inc. One Main Street, Cambridge, MA 02142 (617)-494-8200							
$95	NA/ 540	Index Technology	Excelerator, Excelerator/RTS, XL/DI, PC Prism	Dennis Barham, CIGNA Corp., Windsor, Conn.	Sept. 1990, New Orleans	One annual conference; quarterly newsletter; software library	Pamela Meyer, Index Technology (617)-494-8200
XPEDITER User Group 535 Race Street, San Jose, CA 95126 (408)-286-7500							
None	None/ 1,002	Application Development Systems	XPEDITER (testing/debugging), NAVIGATOR (source analysis) and SQLizer (DB2 development).	James McDonald, Blue Cross of Ill., Chicago	March 18-21, 1990, San Francisco	One annual conference; quarterly newsletter	Audrey Williams coordinator (612)-560-8633

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Calling All User Groups!

Please send information about your user group to be included in DATAMATION's User Group Directory. Please include address, phone number, number of members, names of officers, date of next meeting, statement of purpose and a list of services provided. The address is: DATAMATION
275 Washington St.
Newton, MA 02158
Attn.: David R. Brousell

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

THE NEW IBM

Can Customers, Managers and Allies Move IBM Into High Gear?

Also in This Issue:
Is Your Data Ready for the Repository?
On-line Applications Grow Up
The Promise and Problems of Fractional T1
Washington's IS Leadership Gap

VOLUME 36
NUMBER 1

JANUARY 1
1990

DATAMATION

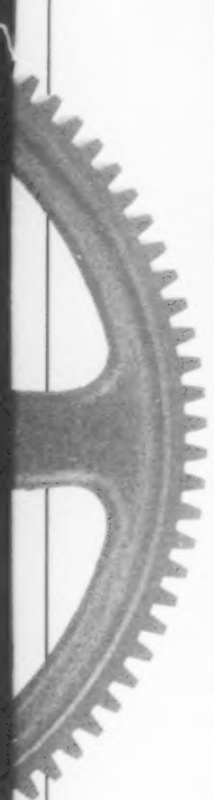
FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

COVER STORY

Customers like Frito-Lay's Charlie Feld are starting to believe again.

Managers like Robin Sternbergh are cutting through blue tape.

Allies like CTG's David Campbell give IBM's SAA professional service.



How Customers Help the New IBM 20

BY JEFF MOAD AND SUSAN KERR The needs of information systems users are growing so complex that IBM has had to rethink the way it does business. It's pushing power and people out to its field offices, pushing products out the door faster and pushing alliances wherever they add value or insight. But will that be enough to satisfy customers?

How Line Managers Run the New IBM 28

BY JEFF MOAD AND SUSAN KERR Never has so much authority been invested in the seven executives who head IBM's lines of business and the field troops beneath them. The idea is to make IBM more customer-oriented. But problems with products and employee attitudes leave room for doubt that customers benefit from such autonomy.

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Cover photography by David Bradley CAD drawing by Pat Boyle

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Companies with expanding populations of PCs also have a widening pool of corrupt data that is more of a liability than an asset.

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There is a shift from the on-line transactions being a support service to the on-line service being the business itself.

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The kinds of things we do here absolutely require that we use distributed approaches.

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BY JANETTE MARTIN Faced with how best to use sophisticated PCs, one IS pro has come up with a solution involving a new vision in workstation software.

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INSIDE DATAMATION

Entering the Age of Collaboration

The ability to collaborate will separate winners from losers in the global race of competitiveness in the 1990s. Externally, organizations must allow customers, suppliers, third parties and even competitors in some instances to actively participate in the day-to-day operation of their enterprises, as well as in the long-term strategies they pursue. Internally, the managers of such organizations must work together to ensure that common objectives are not sacrificed in the name of decentralized decision making, the hallmark of today's ever-flattening corporations.

This axiom—collaborate to compete—holds true for all types of organizations. A university can only thrive if students, professors, corporate affiliates and suppliers (of textbooks, PCs, etc.) educate themselves about the roles they should play. A hospital can only deliver quality care if patients, nurses, doctors, insurance carriers, government agencies and medical equipment makers tackle the issue of exploding health-care costs in unison. And so on.

But perhaps no other segment of commerce and industry is as affected by the call of collaboration as the computer industry itself. The increasingly complex requirements of information systems customers demand unprecedented levels of integration and cooperation from suppliers of such systems. This, in fact, is the essence of the New IBM. It's also the company's biggest challenge—perhaps the biggest ever.

Photographs by Dave Bradley

COLLABORATORS MOAD AND KERR interviewed IBM execs, customers and competitors.

To judge whether IBM is adapting quickly enough to the collaborative environment necessary to nurture the sorts of IS solutions customers will demand in this new decade, senior writer Jeff Moad and San Jose bureau manager Susan Kerr joined forces to produce this issue's cover story. Their interviews with 20 IBM customers; a half-dozen IBM line of business executives; and handfuls of IBM allies, competitors and experts yields a three-part analysis unprecedented in its depth and scope.

"The changes at IBM have focused on two broad fronts," Moad and Kerr report. "The first involves getting the company's massive field sales and support machine, as well as its product development organizations, to understand and solve users' problems rather than just blindly pitch IBM products. The second is to increase the number and type of software applications running on IBM computers so that users' problems can be solved by IBM—or by a rapidly expanding network of . . . partners."

Beyond exploring how customers, managers and allies are shaping IS solutions at the New IBM, Moad and Kerr offer terrific insights to thoughtful managers of all stripes—IS heads, CFOs, business unit chiefs, etc.—insights into the collaborative process so many of them must join, if they haven't already, to win the race ahead.

Looking Ahead in 1990

Collaboration on a broad scale has been under way for a number of weeks at the magazine. DATAMATION's staff of experienced bureau managers and editors has been canvassing IS vendors, users and analysts in search of a framework that readers can use to build winning IS strategies in the years ahead. Fittingly titled, "Systems and Strategies for the '90s," the framework will be erected in a year-long series of articles that begins in our next issue.

Make it a great New Year and an even better New Decade.

Tim Mead

Tim Mead, Editor-in-Chief

DATAMATION

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On-Line Applications GROW UP

The ever-increasing need for real-time business information is pushing on-line transaction-processing applications out of their once narrow market niches.

BY LEILA DAVIS

Competitive business pressures and demands for faster customer services in most industries are generating more interest in on-line transaction processing, say IS executives, and new OLTP systems with better price/performance are making the conversion to on-line more attractive economically.

The recent introductions of mainframe-class OLTP machines from Tandem Computers Inc. and Digital Equipment Corp. give user companies an assured growth path, as more new applications come on line and the size of existing on-line transactions grows, requiring more capacity.

"Time is compressing," says Jon W. d'Alessio, vice president of operations planning and information technology at McKesson Corp., the San Francisco-based pharmaceuticals maker, and a prime example of the type of user that is boosting the market. "We will move most of our systems on line; there is too much of an efficiency gain not to do it. We are trying to stay ahead of everyone else. We want to have quicker and better service than our competitors."

CoBank National Bank for Cooperatives, in Denver, is also eying mainframe power to fuel the growth of its on-line systems. "Within three years, we will need to move up to a 30MIPS machine for all our on-line applications; I feel more comfortable knowing the DEC 9000 is out there," says William J. Ross, CoBank vice president for information management.

Analysts predict growth at all levels of OLTP, as evidenced by the release of smaller machines, such as Stratus Computer Inc.'s new low-end XA2000 model 30.

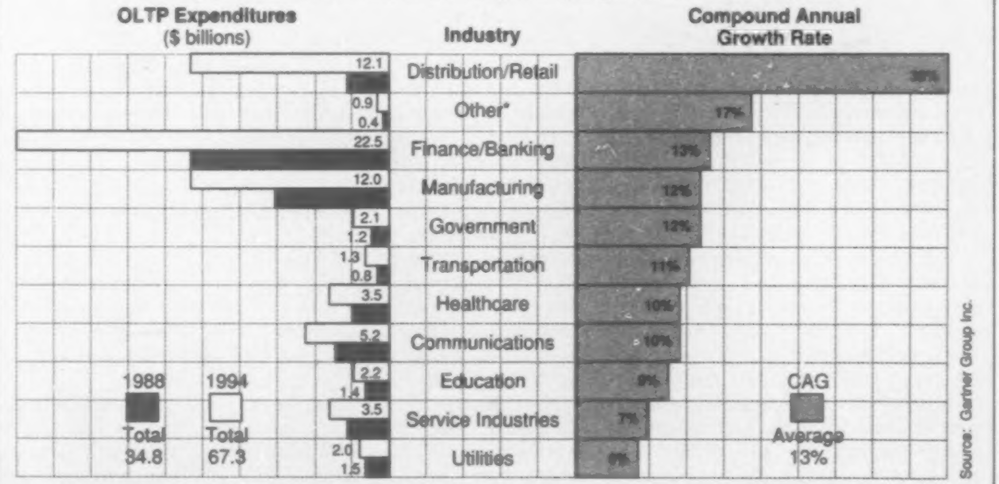
All of this activity belies OLTP's historical classification as a specialized market segment. Indeed, some users say they will move their core mainframe applications that interact with OLTP applications to OLTP systems. Overall, San Jose, Calif.-based Dataquest Inc. predicts the worldwide OLTP market will have reached $31.4 billion in 1989 and will grow to $35.8 billion this year. By 1993, Dataquest sees a $52.5 billion market. Figures from Gartner Group Inc. show even stronger future growth, predicting a $70 billion market by 1992.

Jeffrey Schulman, vice president of software management strategies at the Stamford, Conn.-based Gartner Group, says of the growth: "Look for more front-office on-line applications. OLTP is coming out of the back room and becoming very interactive with the customer."

Faster, better customer service was the motivation for cosmetics maker Helene

Which Users Are Adopting On-Line Systems

Companies in distribution and retailing, with their requirements for just-in-time inventory and lightning fast customer service, lead the way in adopting on-line transaction systems.



Source: Gartner Group Inc.

*Includes Agriculture, Construction, Mining, etc.

Curtis Industries Inc. in Chicago to plan an on-line order-entry and finished goods inventory system. The firm changed its strategy of being a low-cost maker of cosmetics products to being the supplier with the best service to its retailers, according to Tom Gildea, vice president of business information services.

The strategic shift was prompted by the movement toward what the retail industry calls "quick response," a strategy of better manufacturing and inventory management using information systems technology, says Gildea. A new 300,000-square-foot, $32-million Helene Curtis warehouse is expected to decrease the firm's shipping costs by 25% when fully equipped with a Stratus XA2000 model 120 running warehouse management system software from Zethcon Corp. of Park Ridge, Ill.

On-Line Businesses

The change at Helene Curtis illustrates the shift in perception that is propelling the growth of on-line processing systems, says Bill Elliott, Stratus' vice president of strategic planning. "There is a shift from the on-line transactions being a support service to the on-line service being the business itself. It is almost a mental shift rather than a technological shift," Elliott says. "For example, people have been running automated warehouses for years, but now Helene Curtis sees it as a strategic business element."

McKesson is using Tandem systems to run two separate strategic on-line applications—a prescription claims service (PCS) and an on-line inventory information system for its pharmacist customers. The PCS will be converted to the new Tandem NonStop Cyclone, introduced last October, as soon as that mainframe becomes available early this year.

☐ Some Businesses Could Take An Outage Of An Hour Or So, But We Can't.

The PCS processes prescription insurance claims on line through a credit card authorization procedure while the prescription customer waits in the pharmacy. The customer runs the credit card through a reader, and McKesson determines the customer's eligibility and deductible on line, so the pharmacist can charge the customer accordingly. The PCS then sends the claims-processing transaction to the insurance company, often in batch mode later in the day.

MANAGING INVENTORY: Helene Curtis uses radio frequency terminals aboard lift trucks (inset) to display pickup instructions generated by its Stratus-based distribution system.

Today, the PCS runs on Tandem VLX machines that link into an IBM 3090 model 200E. McKesson uses the Tandem Guardian operating system on the VLXs in combination with proprietary programming. When converted to the Cyclone, there will be no changes in the application, just "more horsepower," says d'Alessio.

McKesson also uses Tandem VLXs for an on-line application that lets pharmacists know whether products being ordered are in stock, indicating the products can be delivered. "We hadn't been able to tell a pharmacist customer whether we had it [a particular product] in stock before, so he had to wait until it either showed up or it didn't," says d'Alessio.

Although some IS executives may employ an IBM 3090 such as the new model J for OLTP, most prefer not to expose online transactions to the necessary maintenance and management downtime required for the core mainframe, users and analysts say. Instead they prefer to use a dedicated OLTP machine designed with a higher degree of reliability.

Helene Curtis, like McKesson, has an IBM mainframe linked to its Stratus OLTP system. "I just recently had a conversation with some counterparts about using an IBM mainframe directly for OLTP," notes Gildea. "The relative economics of the 3090s are very expensive. We won't ever use our mainframe for OLTP because we have other things running on it, and because we can't spare the downtime for maintenance.

"And because 70% of the data in our warehouse system is germane only to the warehouse and doesn't need to go to the mainframe, it would create an additional expense to have that on the mainframe," he adds.

The cosmetics maker's 3084 running MVS/XA contains its DB2-based order entry system. "Warehouse inventory status is updated constantly on the 3084. Now it is actually batch, but it will be on line soon," says Gildea. However, although inventory will be updated on the IBM machine, all transaction processing is being done on the Stratus system.

Encroaching on Batch Territory

If the core mainframe may not take over OLTP operations, OLTP machines may take over at least some applications from the core mainframes. Some analysts see Cyclone as a direct competitor of IBM's 3090 for applications that interface with on-line processing systems.

McKesson's d'Alessio sees that competition in own his shop. Some batch claims-processing procedures will be moved from the 3090 to the Cyclone when it arrives. "There is a constant tension between the two, but that is good, because both machines will keep us pushing for the best possible solution."

According to Jeffry Beeler, an industry analyst at Dataquest, Tandem had been marketing to IBM customers in an effort to capture only their OLTP processing. "[But] now they are saying, 'give us everything.'"

Tandem isn't the only vendor taking aim at IBM. Digital Equipment Corp.'s new VAX 9000 machines are aimed at giving VAX shops with rapidly proliferating OLTP applications a migration path. "It used to be that a DEC shop had to convert to an IBM mainframe down the line, but we have been lucky because our growth has coincided with DEC hardware announcements, and now we are seeing large OLTP software applications becoming available," says CoBank's Ross. "We will save a lot of money by not having to convert."

Like Tandem, Digital users could choose to expand their OLTP applications by stringing smaller VAXs together rather than moving to a mainframe machine. "But I didn't like the complexity of stringing a lot of 6300s together," says Ross, who already has twin 6300s (a 6330 and a 6310) as the nucleus of a system powering 10 regional offices and the parent office in Denver. Eighty percent of the systems' operations are on line.

McKesson's d'Alessio makes the same observation about having chosen Cyclone, rather than adding more VLX machines. "You can link up to six VLXs, but after that, you have to have two separate systems. With Cyclone, you have one system, so it is easier to maintain and manage; there are fewer interconnections. There is a fair amount of value in the simplicity," he says.

Stratus says it recognizes the need for more horsepower in OLTP applications, but is addressing it for the time being by linking its XA2000 systems together. "We introduced the model 30 so people could afford to move applications on line," says Stratus' Elliott. "But we don't expect to sell a lot of them individually. If a customer wants the same system in every location, they can put one wherever they need it."

Until it moves to a VAX 9000, Digital user CoBank is satisfied with its VAXcluster. The system is delivering the extensive access to on-line applications CoBank requires at its 10 regional offices (10 separate banks that merged last year). CoBank's VAXs run VMS and have an integrated database using MUMPS as its database language. Its main on-line application, a loan-accounting system, is a package called Profile from Sanchez Computer Associates Inc. of Malvern, Pa.

☐ NEW MAINFRAME CLASS OLTP MACHINES GIVE USER COMPANIES AN ASSURED GROWTH PATH.

Profile runs retail and wholesale banking operations, such as teller transaction processing and mortgage loan processing on line, and is one of the few large-scale on-line applications specifically written for DEC VAX hardware, according to Ross. The first of the 10 regional offices went up on Profile in late 1989. The second office will come up in February, with another office being added each month after that. The budget to bring all 10 offices onto the VAXcluster, including the on-line applications, has been set at $3.5 million, says Ross.

Also provided on-line from the 15MIPS VAXcluster are word-processing, spreadsheet and ad hoc report-writing capabilities. Having a high percentage of on-line transaction processing is a strategy at CoBank, where data entry no longer exists as a dedicated job function.

"We only have two tape drives, and one is for backups; everything else is on line. We made a concentrated effort to bring up on-line applications rather than batch because of the high cost of people. Instead of employing a lot of data entry people, we've put those people out in the field, working with customers," says Ross.

Because so much of the bank's operations are on line, reliability is extremely important. For prime transaction time, Ross demands 99.5% availability per month; during off hours, he demands 98% availability per month. "The machines have been extremely reliable, running at 100% for the past six consecutive months at the central office," says Ross.

The Reliability Factor

Reliability was a crucial factor at Helene Curtis, as well—so much so that the fault tolerance of Stratus' systems was the overriding consideration in its choice, according to Gildea. "Our reason for picking Stratus was the fault tolerance. I did have a conversation with DEC reps, but high reliability is not fault tolerance. Our entire warehouse is dependent on this system. Any delay is intolerable to us. Some businesses could take an outage of an hour or so, but we can't."

Tom Stanek, executive vice president of General Computer Corp. (GCC) in Twinsburg, Ohio, also chose Stratus for its fault-tolerant capabilities in converting an existing on-line operation from NEC Information Systems' Astra machines to a Stratus XA2000 model 120 running Stratus' VOS operating system. "The overriding factor was fault tolerance," says Stanek, "and the greater communications capabilities of the Stratus were also considered."

GCC is a third-party insurance claims adjudication firm with an application similar to McKesson's PCS. The application, by maintaining a database of customer information from insurance carriers, offers on-line claims adjudication to pharmacists while customers wait. General Computer's Stratus can receive data from whatever terminal the pharmacist happens to have, whether it be a credit card terminal or point-of-sale device.

GCC converted to Stratus in late 1989. Now customers at its client pharmacies aren't kept waiting an hour or more in the event of a system failure. "While we were running the old and new systems in parallel during the conversion, we had a six-second power outage. It took one hour to recover the files and resume operations on the Astras. The Stratus brought us back within two minutes," says Stanek.

☐ OLTP MACHINES MAY TAKE OVER SOME APPLICATIONS FROM THE CORE MAINFRAMES.

The Stratus system, which cost GCC between $750,000 and $1 million, will accommodate the firm for the near future, says Stanek, but given the fast growth in his industry, Stanek foresees a need for more horsepower.

"As things grow, we may have to move to a fault-tolerant mainframe, or couple more than one Stratus with a mainframe," he says. "The growth is inevitable. There is too much cost incentive not to have on-line capabilities, and the price/performance of the technology is making it more justifiable than ever before."

Stanek anticipates extending GCC's on-line claims adjudication to physicians' offices in the near future. "We are already planning for physicians' claims. We have to get the insurance companies to accept it technically; they have already accepted the concept."

McKesson also has a clear view of its on-line future. "Now we have some customer data and some product data on line. We need to move our financial systems on line and then take a look at warehouse management. We'd like to integrate it into a paperless warehouse, using bar coding, radio frequency devices in the warehouses, ordering by electronic data interchange and payment by electronic funds transfer," says d'Alessio.

Gartner Group's Schulman expects large, complex transactions such as d'Alessio's to replace the traditionally "skinny, noncomplex" transactions, as the OLTP arena continues to grow at a rate faster than the rest of the market. ☐

Heading for a Soft Landing

Although the U.S. computer industry is struggling financially, it's managing to produce higher performance products. Is this an opportunity for users? Yes and no.

BY MADELINE FRANCHI

Depending on your perspective, the U.S. computer industry is just completing either one of its worst years or one of its best in recent memory. Judged by shipments of hardware measured in dollars, systems manufacturers have experienced their worst growth period since the slump of 1986; their hardware sales should climb only 1 to 2% at best for the year. But gauged by processing power, vendors of advanced midrange systems and providers of 32-bit personal computers and workstations produced upwards of 20% more horsepower than they did the previous year.

An Industry Comeback?

Do such business conditions give systems customers the upper hand when negotiating prices? Maybe yes—for suppliers that have done little to improve their product lines. But maybe no—where suppliers have dramatically improved their computers' performance.

Unfortunately for computer hardware manufacturers, the downward trend in shipment revenues continues. Cahners Economics expects growth in shipments to bottom out in the third quarter of 1990. That scenario places U.S. shipments growth for computers and office equipment at just 1.6% in 1990.

DATAMATION and Cowen & Co.'s recently completed study of buying intentions among U.S. users of PCs, workstations and midrange systems confirms this outlook, to a degree. Although the study projects a 27.3% increase in workstation revenues and an 11.3% gain in PCs, it forecasts a 10.5% decline in the dollar value of minicomputer shipments between July 1989 and June 1990. Because minicomputers carry a much higher price tag than workstations—$103,000 vs. $13,000 on average—their drop in popularity has a much bigger impact on the industry's financial health.

Smart VARs

New large-systems announcements like Tandem Computers Inc.'s Cyclone family, Digital Equipment Corp.'s VAX 9000 mainframe and IBM's 3090 J and JH models should improve well-being, by mid-1990, when these systems begin shipping in significant quantities.

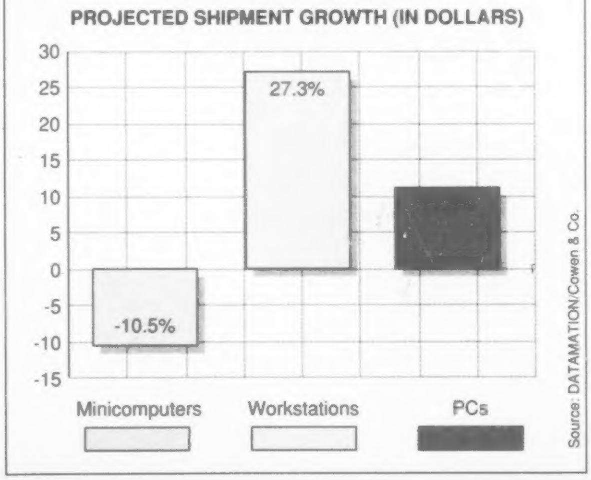
Still, the short-term outlook, while not rosy, could be worse. In this latest U.S. economic contraction, lower inventories will help break the industry's fall. In the prior boom-bust cycle for the computer industry, the inventory-to-shipments (I/S) ratio (another term for current supply) swelled from 2.33 months' worth of inventory in May 1984 to 2.70 in April 1985 according to the U.S. Department of Commerce. This time around, the story reads differently. Since June 1988 when the I/S ratio equaled 1.91 months, the ratio has fluctuated but has moved no higher than 2.29.

So although I/S ratios have crept back up, they still reflect disciplined inventory levels. No major inventory stockpiling means no severe correction. This stability supports the contention of a milder downturn for the computer industry compared with 1986.

Looking for the next upturn for the computer and office equipment industry? Turn your calendar to 1991. The word from Cahners Economics is a 12% hike in U.S. factory shipments of computers and office equipment in 1991 ▭

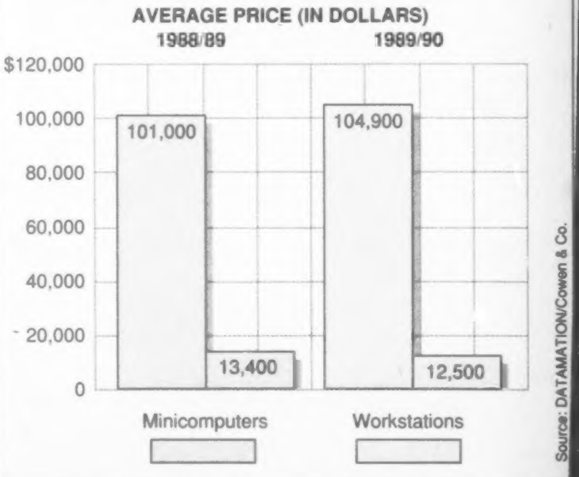
Minis Drag Down the Market...

Despite the strong growth of workstations and PCs, the drop in minicomputer demand is pulling the industry down to an overall 9.4% revenue growth rate.



...But Don't Plan to Buy Minis Cheap

The average price of a minicomputer is rising, while the price tag on a workstation continues to fall.



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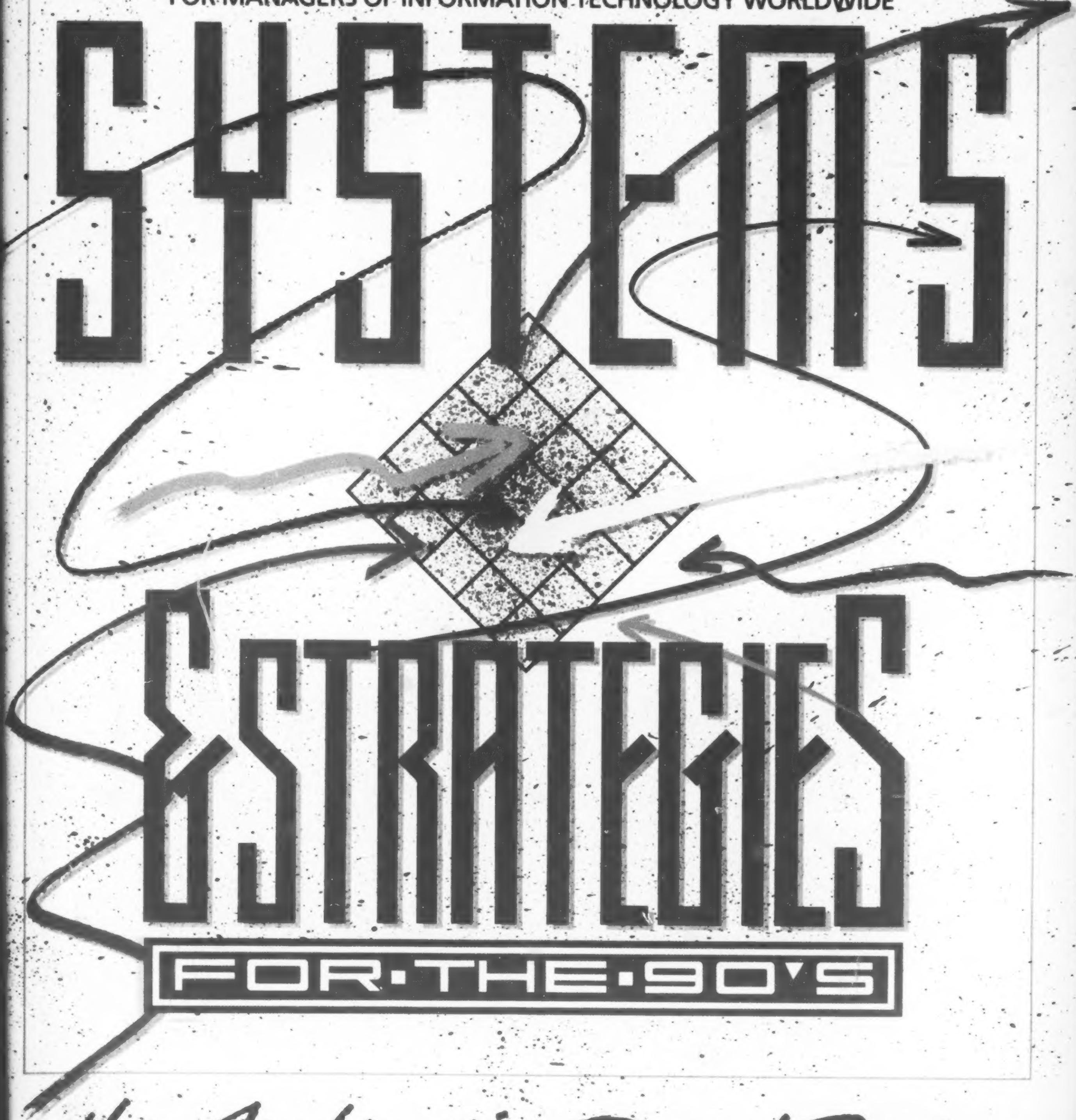

SYSTEMS STRATEGIES

FOR·THE·90'S

the Application Decade Begins

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NUMBER 2

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1990

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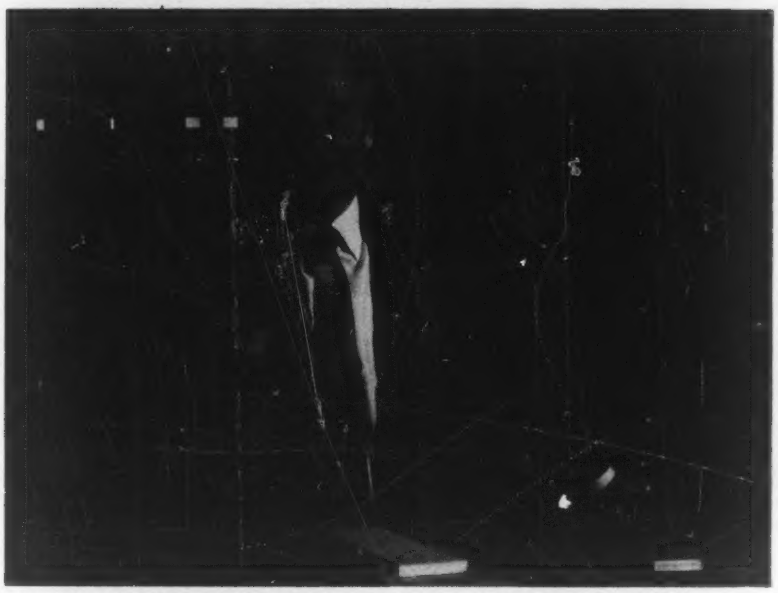
FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

COVER STORY



Merrill Lynch's Duwayne Peterson sees the giant brokerage firms's biggest IS challenge in the '90s as applications development productivity.

The Application Decade Begins 22

BY PARKER HODGES As the 1990s begin, users and suppliers are intently focused on being more productive and more business and technology savvy. The goal: the application.

How ADP Is Renewing Itself 28
McCormick's Drive for Connectivity 29
Xerox Redefines Its Core Business 30

Cover design by Tim Girvin Design.

Systems & Strategies for the 1990s debuts with this issue as we begin The Application Decade. Our year-long series on the information technologies and strategies that will make a difference in the 1990s endeavors to examine in depth all major components of computing. Open systems, networking and distributed database systems will merit our special attention, as will other aspects of distributed computing.

INSIGHTS ON DISTRIBUTED COMPUTING

By the end of the '90s, most corporations will have their PCs hooked to corporatewide networks.

Jon Shirley, Microsoft Corp.
PAGE 22

What choice do you really have but to use Windows?

Kavan Moody, Bank of Boston
PAGE 47

White-collar productivity is the same today even after all the huge investments in PCs.

Steve Wendler, Gartner Group
PAGE 52

DATAMATION
FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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DBMS

A New Database For New Times 35

BY WON KIM A host of new distributed applications using CAD, CASE, expert systems and other technologies may require a new generation of database software—oriented around objects, not relations.

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A Clear View For Windows 47

BY JOHN McMULLEN The popularity of Microsoft Windows for DOS-based personal computers has become irresistible, even as IBM and Microsoft emphasize the virtues of OS/2 and Presentation Manager.

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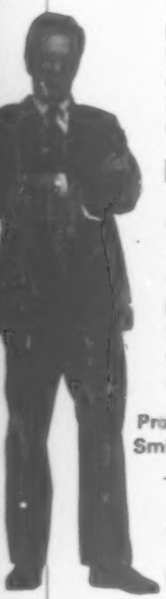
OA

The White-Collar Productivity Push 52

BY CHRIS SIVULA Vendors are promising to escape the white-collar productivity doldrums in the 1990s with office automation offerings that allow custom office systems.



Productivity directors like Cigna's Ernie Smith are seeking enterprisewide OA systems.

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What's Taking the Risk Out of RISC 61

BY BOB FRANCIS Until now, most RISC systems have found their way into user organizations via compute-intensive, autonomous business units. But that's changing as RISC's ally, UNIX, catches on.

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BY BOB FRANCIS Users of electronic publishing systems, which were first implemented in companies as islands of automated publishing, are now looking at the activity on an enterprisewide basis.

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Virtual Net Battle Yields User Savings 71

BY SUSAN KERR A price-cutting clash between three major carriers has created an opportunity for users to enjoy major savings in virtual private network and telecommunications costs.

AT&T, MCI and Sprint are at war over network services offered to users.

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BY TOM McCUSKER Individuals who know which information technology tools to use to match the products and services of their organizations with the needs of their customers are fast becoming competitive necessities.

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Early Wins Are Key To System Success 79

BY W. BURRY FOSS Management techniques that focus on generating excitement through early results in applications development can expand the potential of modern software tools to improve productivity.

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A Power Play For Workstations 83

BY MARTIN HEALEY The future is a world of challenge and promise for workstation users, as developments in chip technology, open systems, CASE and object-oriented programming open the door to competition from PCs and worldwide suppliers.

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The Software Doctor

Hooray! Effective project management ["Project Planning Made Easy"] (Oct. 15, 1989, p. 49) in IS is finally coming out of the closet. A few years back, I suggested to a major manufacturing systems software house catering to aerospace and defense that they use their MRP-II package to manage their own software development projects. Everyone laughed, until one project manager in the back of the room said he had been doing exactly that for years.

Software development project management is more than just planning and scheduling. Resources contention and priority conflicts need visibility so corrective action can be taken to meet delivery dates. Capacity planning highlights overloaded (oops) work centers. Master scheduling keeps all module and project due dates realistic. Because each deliverable module can be given a part number and collected into bills of material, revision and configuration management can be maintained. Tracking all projects' progress not only keeps the due dates (oops again) valid but also is an effective tool for cost and schedule performance measurement.

Why scrunch project management packages to mold them into the alien IS environment? MRP-II software is designed for this type of project and process definition, planning, execution and costing. It comes in all sizes and flavors from the PC to the mainframe platforms. All it takes is an understanding of the MRP-II concept and a little ingenuity in creating bills of material, routings and work centers. I know because I did it.

You IS folk have been helping those of us in manufacturing manage our resources for years. Physician, heal thyself.

Donald N. Frank
Plossl and Frank
Florham Park, N.J.

Another Dose of Noise Cures

The article in the Aug. 1, 1989 issue on noise problems ["Cures for Noise Problems," p. 47] is useful, but does not address several significant issues.

The first is that often only a small segment of a system may be really critical for power quality. Providing a UPS for 100kVa of computer power when maintenance of 1kVa will serve until emergency power can be activated can be both inefficient and not cost-effective.

A UPS can easily be a culprit rather than a lifesaver. Rectifiers, particularly SR types, generate extensive harmonic output that can easily interfere with system operations. The fact that a battery may be "noise free" does not prevent reflection of harmonics onto a power source. In fact, fluorescent lights also generate harmonics: only incandescent lamps and electric heaters are not major culprits. All electronic systems normally have rectifiers that can, and do, introduce noise. Assuring harmonic free sources and loads can be critical to computing and other systems.

Use of a rotating converter or motor generator for AC/DC or AC/AC conversion isn't the highest tech, but it has a great deal to offer. The main converter can output 400Hz or higher frequency power. And there will be no reflected harmonics back into the main power source, reducing problems with PCs, fluorescent lights, etc. Multiple electronic conversions from AC to DC to AC at another frequency to DC again only complicate the problem.

At points of utilization, rotary converters for AC/DC conversion can have a much lower noise level than a rectifier system with an associated DC/AC/DC conversion system. Because of the multiple-segment commutator (or its electronic equivalent) switching occurs at very small voltage differences, with an absence of instantaneous interruption of current and freedom from the resulting "inductive-kick" effects, which can provide a significantly better noise field situation.

Battery backup is still possible, but it will be needed as an interim source while switching to a local emergency diesel or other generator, which can operate at high frequency instead of 60Hz. The battery can be kept charged from the field-excitation unit used to stabilize the converter output voltage. Diodes can provide the required emergency switching.

The issue is to localize and minimize nonlinear loads of all kinds while at the same time assuring UPS service to critical elements. Only critical elements that are both voltage- and interruption-sensitive should be carried on a UPS system in any case. Any parts of a system that can have operation interrupted for a short period without damage to the system or its function should be allowed to die gracefully, at least until an emergency generator is on line.

Keats A. Pullen Jr., P.E.
Kingsville, Md.

Correction

The Tandem Computer Inc. system referred to in the November 15, 1989 Look Ahead is the LXN 32 bit multiuser computer.

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Why Business Analysts Are Indispensable to IS

Individuals who know which information technology tools to use to match the products and services of their organization with the needs of their customers are fast becoming competitive necessities.

BY TOM McCUSKER

Their titles vary company by company, but their function essentially is the same: to evaluate a company's information systems strategy within the context of its business needs and goals.

They are called business analysts, strategic system planners, information systems architects or a host of other names that come to mind. The position, relatively new, is being created in more and more organizations "in recognition of how important information systems are to the long-term health of our business," in the words of one analyst, Michael J. Polosky. A 25-year veteran of Pacific Bell Co., a unit of Pacific Telesis Group, Polosky, 46, is the Bell operating company's assistant vice president for Systems Planning and Technical Services in San Ramon, Calif., near San Francisco.

THE UNIQUE ASPECT of Polosky's job is that he really deals with translating business direction into a technology perspective.

He has held the position three years. Before this, Polosky, who graduated from the University of Santa Clara with an electrical engineering degree, says he had held 20 different positions with the company. His former positions were equally divided between technical and operational functions.

Currently, Polosky reports to Jack Hancock, the company's vice president for systems technology, who in turn reports to Marty Kaplan, executive vice president for customer services. Polosky also works closely with PacBell's corporate planning, network and marketing groups.

Polosky is responsible for all planning within the company's systems areas. Systems include mainframes from Amdahl Corp., IBM and Control Data Corp.; midrange machines from AT&T, Data General Corp., Digital Equipment Corp., Hewlett-Packard Co. and Pyramid Technology Corp.; and microcomputers from Apple Computer Inc., Compaq Computer Corp. and IBM. Polosky is responsible for determining the architecture, standards, methodology and tools the company uses to develop software, as well as portfolio management. But he says the critical challenge lies in ferreting out what the business side of the company needs in the way of technology and then translating these needs into workable systems.

Polosky recently discussed his work and the work of his counterparts in other companies in an interview with DATAMATION. Here are some highlights from that conversation.

Q: You have a background in both technical and business operations at Pacific Bell. Is that typical of your counterparts in other businesses?

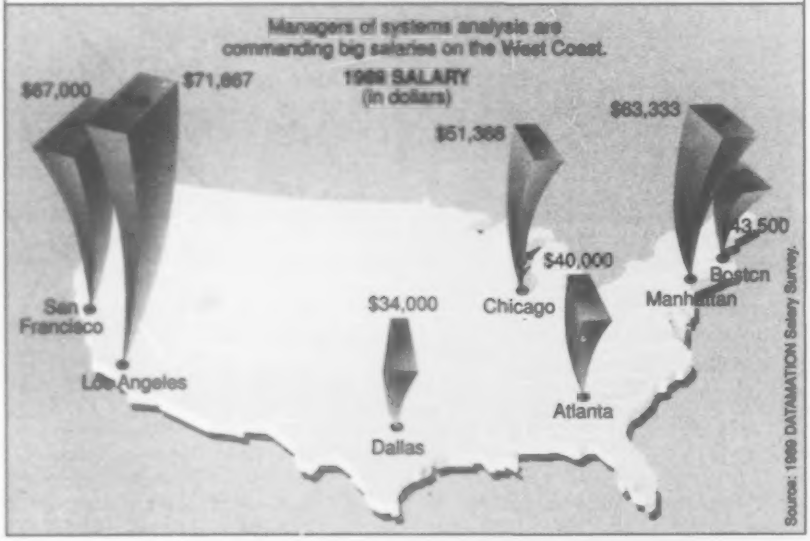
A: These people typically have been involved in strategic planning for a long period of time, usually with a network or a systems background. But in a lot of cases not both. At least in the telephone or communications business, these have been distinctly different disciplines. It's only been in recent years that we've begun to recognize how closely they need to come together. They would have been either experts in planning, or they would have come up in one of these

Photograph by John Marriott

sure that we match the resources with the needs.

On a dotted line basis, we have people out within the development organization that operate what are called "strategic focus divisions." Using our integrated transition plan, they effectively manage these portfolios. One manages the billing component, another the customer interface, another the provisioning and so forth. They begin to break that plan down into more tactical steps. They begin to worry about how to do requirements, when to begin the design work, etc. We work very closely with these groups.

What Business Analysts Are Worth



Source: 1989 DATAMATION Salary Survey.

I have a very small organization, but we work with other organizations in the business. This includes the Integrated Task Force Group—an organization of all the primary planners, including myself, the marketing director, the director of technical training and my peer on the network side, who are managing the planning and implementation of the major components of technology.

Q: What's the business analyst's salary range?

A: I'm not sure the term *business analyst* is the one that I would use. I really believe it's more like strategic technology planning or business planning/technical planning, if you will. I think the salary varies depending on the function. If it's a person analyzing a component part of your overall plan, that's one thing. If it's the person orchestrating the entire plan—the characteristics that people in my position would have—it's another.

I have people doing analyst work who would be making $35,000 to $75,000 depending on the job's scope. People at the fifth level of management or at the assistant vice president level would be making substantially more than that, obviously.

Q: What's the future for business technology planners, as you call them?

A: Businesses that don't have these functions are going to have to bring some people in to do this kind of work. The ability to take your business needs and to translate that into what kind of technology infrastructure is needed to meet these needs is absolutely essential. People are going to have to be available who understand not only technology but also the business directions of organizations.

Q: What are the career paths of analysts or planners?

A: Given that they are well steeped in both technology and business planning, they could do several things. First, they could head one of the technical organizations in an organization. Second, they could probably provide good guidance in a marketing area. Third, they could be well positioned to lead the entire organization. Several other steps would be involved, so I don't want to imply that by doing [what we do] you're the next president of the company. But when you think about the characteristics we're talking about to do these kind of jobs . . . if you didn't aspire to eventually develop into a CEO or COO, you certainly would be in position to act in an advisory capacity to the key officers of the business.

Q: Do your counterparts share that view?

A: To be honest, I haven't discussed upward mobility much with my peers . . . because the focus is on the job at hand.

Q: Given a knowledge of the business direction and of the technology, what other skills are required to perform effectively as a business analyst?

A: Very good listening skills. You're interacting with other components within the business, trying to understand their direction. You also need to have the ability to compromise. As you deal with overall business direction, there's always a series of constraints, whether financial or human capabilities. Your task is to deal with these and offer the best solution to support the company's business needs.

☐ WE VISIT WITH KEY VENDORS TO SHARE PACIFIC BELL'S BUSINESS DIRECTIONS.

Q: Do you have any special relationships with vendors in order to keep ahead of technology innovations?

A: Yes. Each year, we visit with key systems and network vendors in order to share Pacific Bell's business directions, such as where we are going and what is our primary focus. Usually, the vendors will in turn share with us what their direction is, including future products. These discussions will enable us to determine such things as, Do we share a common architectural direction? Are they providing platforms that have the functionality that we want? and whether we can interoperate these platforms with those of other vendors.

Obviously, we do not want to team up with only one vendor. We want to operate in a multivendor environment. In addition to product offerings, you also have to stay attuned to changes in the industry. In our business, for example, that means keeping track of the evolution in the network and what's happening in the telecommunications business, such as changes in the regulation aspects of the business. You need to be cognizant of all those things that have an impact on your ability to do your job. ▭

A CAHNERS PUBLICATION

INTERNATIONAL EDITION/FEBRUARY 1, 1990

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

SYSTEMS & STRATEGIES FOR THE '90S:

THE TOMORROW ORGANIZATION

Can IS Managers Reintegrate Their Companies?

Also in This Issue:

The Stages of CASE Usage

The Applications Wave Behind ISDN

Technology's Rewards Without the Risks

UNIX Ports in Europe

VOLUME 36
NUMBER 3

FEBRUARY 1
1990

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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CIOs like UNUM's John Alexander Jr. (center) and his team huddle to devise technology strategies that will enable the life insurance organization to thrive in the 1990s.

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BY RALPH CARLYLE How do you decentralize and establish strong central controls simultaneously? The answer is to coordinate the two through a combination of IT, entrepreneurial teams, multidisciplinary workers— and, yes, the trusty old management hierarchy.

Cover Photography by David Bradley
Special thanks to "Say Brother," WGBH TV Boston and Set Designer Clinte Heitman for use of their studio.

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Users like ARCO's Greg Zwick like today's interfaces.

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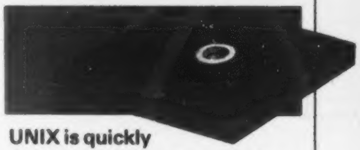

UNIX is quickly moving onto European docks.

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Europe's Grand IS Alliances 81

BY JOHN LAMB European IS suppliers are pairing and partnering in preparation for 1992, while their users wonder what advantages these research, development and distribution alliances will have for them.

Special supplement, not included in all issues. 88—1

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Building Tomorrow's Organizations

Corporations and institutions in the future may look more decentralized than ever, but they will act more centralized than most management gurus ever dreamed possible. Globalization demands such behavior. Information technology enables it.

As simple as this message sounds, it promises to be a difficult one for organizations to carry out. Worldwide competition requires a radical shift in companies' approach to managing people and resources away from hands-off autonomy to hands-everywhere coordination.

Industrial enterprises that thrived in the 1970s and 1980s by amassing dozens of independent business units, all run by disparate information systems, will suffer in the 1990s unless they regroup culturally and technologically to form integrated business units. Those that succeeded in the past on the labors of singularly focused, narrowly trained individuals will fail in the future unless they deploy technology to broaden the span of workers' control, especially managers. "A new breed of manager is required," in the words of one executive, "whom we can say can wear the sweat band, meaning a person who takes responsibility for a project's end result."

These truths became evident to senior writer Ralph Carlyle and his DATAMATION colleagues on the second leg of their journey chronicled in our year-long series, Systems and Strategies for the '90s. In this issue's cover story, "The Tomorrow Organization," Carlyle & company have discovered that most industries and organizations, and the individuals employed within them, are in the midst of a significant transformation of structure and systems. The change represents the underpinnings of "The Application Decade Begins," the title of our first stop (January 15, 1990) on the road toward defining critical issues and technologies for IS managers.

Photograph by David Bradley

ORGANIZATION MAN CARLYLE led a team effort.

Financial services providers, airline carriers and even computer companies themselves are reshaping the way they compete in the marketplace. All seek global views of their businesses and must, therefore, adopt common procedures, products and IS standards to achieve such vision. The Bechtel Group of Companies, Ford Motor Co., UNUM Life Insurance Co. and other users canvassed by the DATAMATION team share such a view, as do several of their technology suppliers such as Bull HN Information Systems Inc., Codex Corp. and Hewlett-Packard Co. All are embracing the new hierarchies of corporate organization resulting from this vision—lateral and horizontal lines of responsibility centrally coordinated via technology.

Helping organizations see every facet of their operations and managing each concurrently—concurrency may be the hot buzzword of the new decade—are the new responsibilities of IS executives and their staffs. "The idea that IT can truly be an enabler and an asset to the organization is of recent vintage," Carlyle writes. "Technology will allow professionals throughout an organization to . . . do what they want to do, but in a more amplified way."

The enabling technologies may, however, be more advanced than the enabling IS management required to shape the global vision demanded of the marketplace. PCs, workstations, networks, standard operating systems, distributed databases, computer-aided software engineering and other technology tools are readily available. What's less abundant is the management insight and foresight needed to effectively employ these IS elements. Using them to build the architectures needed by tomorrow's organizations takes innovation, courage, stamina, perseverance and a willingness to change.

If such characteristics aren't part of your organization's IS culture, it may not be around to enjoy the next millennium. If they are badges of the culture, tomorrow will certainly be yours.

Tim Mead

Tim Mead, Editor-in-Chief

DATAMATION

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UNIX Ports In Europe

The countries that launched the open systems movement are increasingly counting on portable software in a range of applications.

BY PETER JUDGE

UNIX, the portable operating system that has cruised around the world, is dropping anchor in commercial ports around Europe—where the open systems movement was first launched. Over the last four years, European shipments of UNIX systems have steadily increased, particularly at the low end of the line, where 49% growth gains were chalked up in 1988. Many of those UNIX-based PC and workstation products are powering office automation (OA) applications in both private and public sector organizations.

Much of the momentum behind Europe's commercial UNIX wave is coming from the public sector, primarily because this is where commercial users take their cue. Early UNIX users, European governments and public utilities were quick to see that UNIX would allow them to buy cost-effective systems.

The most symbolic and significant user in the public sector is the European Commission (EC). The EC is standardizing on UNIX workstations for administrative chores and has laid down an open systems policy. By promoting open systems, including UNIX, the EC hopes to create a larger and more diverse market in Europe.

Illustration by David Barber

Following the Leaders

Following the EC's lead, the governments of France, Sweden and the United Kingdom have established their own explicit UNIX policies. Every two years, the Swedish government chooses four or five vendors to satisfy all of its UNIX contracts—contracts that were worth a hefty $145 million during the most recent round. The bulk of that business went to NCR Corp.

The Swedish government's UNIX mandate has influenced buying decisions in that country, says Hans Johanssen of the Swedish UNIX User Group. "When a company is thinking about a new system, it is very common for them to state that it should be UNIX."

The French tax office plans to install 800 UNIX systems by 1994, and the French ministries of agriculture and education have both launched mammoth UNIX projects. Meanwhile, France Telecom, which has 300 UNIX machines installed in its offices, expects to plug in another 700 units by 1993.

The West German government is still experimenting with UNIX, "Many [West German] government plans require UNIX, [although] there is some local flavor," points out Achim Brede, director of Bredex GmbH, a Braunschweig software house and vice chairman of the German UNIX User Group.

Although the Dutch government has yet to make an official endorsement of UNIX, Marton van Gelderen of the Dutch UNIX User Group thinks it's only a matter of time. "The [Dutch] government will eventually pick UNIX," he predicts.

Van Gelderen's reasons for the prediction are similar to those of others who have chosen the operating environment: flexibility and portability. "When an application runs under UNIX, it will survive hardware changes," van Gelderen says. "In the UNIX environment, there really is compatibility. It is fun for the suppliers and it's also fun for the users. You can change the underlying hardware without too much disruption of day-to-day services. You can choose the hardware that best suits your particular problem."

Various governmental advisory bodies in European nations are also climbing on board the UNIX bandwagon. In Britain, the Central Communications & Telecommunications Agency (CCTA) considered developing its own definition of a UNIX environment for government use. The idea was subsequently rejected in favor of a more general recommendation for products compliant with POSIX and the X/Open Portability Guide.

CCTA has installed some 20 Olivetti 3B2 PCs, which are spread between its two sites in London and Norwich. These UNIX workstations, which are connected over two Ethernet local area networks linked together by an X.25 wide area net, handle office automation and electronic mail applications. Other functions are gradually being added. "That perhaps is the point of open systems," says a CCTA spokesperson. "They give you the flexibility to do more or less what you like, more or less when you like. You don't have to add a new system to add a new function."

As the public sector leads the way with UNIX, the private sector is certainly following. Public sector support has been crucial in priming the whole open systems market. It encouraged product development by reassuring vendors that the market for UNIX wares would indeed be large enough.

TOTAL COMPANIE'S NOEL: The oil company ported its UNIX application to a Convex computer.

In Ireland, Belfast Chemical Co. and two rival Dublin hardware companies, National Hardware and Associated Hardware, have become UNIX PC partisans. On the growing list of UNIX loyalists in Denmark are many local insurance companies, including the General Fire Insurance Co. and SAS International Hotels, which is currently in the development phase of its UNIX office systems.

Office automation applications are also on the UNIX menu in West Germany at Security Pacific EDP Service GmbH. The $230 million banking service relies on networked UNIX workstations from Siemens AG to cope with OA and leasing administration, as well as with other tasks that require direct host access.

Not only in West Germany, but elsewhere in Europe, UNIX has made the fastest progress on desktops that are destined to remain in the DOS domain. "There is very little available for OS/2," explains Norman Hull, technical director of Q2 Relational Software Ltd. in Carlo, Ireland. "Even links to DOS are better under UNIX," he insists.

There is also considerable interest in UNIX for business applications in France. Roughly 60% of the French users who replied to a recent survey by the Paris market research house Pierre Audoin Conseil (PAC) reported that their major UNIX applications were in the business arena.

UNIX's portability features saved the day for Total Companie Francaise des Petroles, a Paris-based oil company. The company has used UNIX in its Exploration Research & Development Division since 1983 for scientific applications, and it counts on IBM mainframes for its commercial and OA processing chores. Total's scientific applications for geology, geophysics and reservoir modeling are run on Convex Computer Corp. C210 and C220 supercomputers, which operate under UNIX. Graphics processing is done on a network of Sun Microsystems Inc. 3/60 workstations supported by five Sun 3/280 servers.

The Total division had originally relied on a Convex supercomputer and on an ETA supercomputer from Control Data Corp. CDC's decision, last April, to pull the plug on the machine could have posed real problems for Total. But the company found it could port its UNIX applications from the ETA supercomputer over to its Convex C210 and C220 machines. "We found it very easy to move the applications," confirms Dominique Noel, head of IS at Total Oil Marine, the company's Aberdeen, U.K., subsidiary.

Total also discovered the ease of integrating its Convex UNIX applications with its other UNIX systems—the Sun 3/60 workstations and 15 HP 9000 series 300 workstations from Hewlett-Packard Co., which are supported by three HP 9000 series 800 servers. These workstations are primarily used for database work in geophysics and prediction chores. All the division's systems are linked together on an Ethernet network.

Although Total is using UNIX for technical tasks, it's still tentative about using the operating environment for its classical business applications. At the end of last year, the company was deliberating a move to UNIX and is currently investigating this option.

Strategic Applications

Across the Channel in England, the Automobile Association (AA) has opted to use UNIX and other open systems products for developing strategic business applications. The $167 million association, which pulls in most of its revenue from its auto breakdown and recovery service, is Britain's largest private insurance broker.

The AA is currently using Pyramid 9810 UNIX systems from Pyramid Technology Corp. as communications and print servers. The 9810s enable MS-DOS workstations to communicate with series 39 level 80 mainframes from International Computers Ltd. (ICL) in three AA insurance offices. The association is planning to add some more local insurance brokerage applications and to provide some central database facilities.

In 1988, the Automobile Association spent $9 million of its $33 million in capital expenditure funds on IT equipment, and it's looking to trim these costs. "Over a period of years, it is our strategy to reduce the cost of the IS department," says John Strawbridge, AA's information systems manager.

Under the next part of this strategy, AA will gradually phase out its existing OA software by using a UNIX package. Eventually, UNIX will replace MS-DOS at the AA, which has made a definite decision not to adopt OS/2.

☐ UNIX COMPATIBILITY: IT'S FUN FOR THE SUPPLIERS, AND IT'S FUN FOR THE USERS.

AA's Strawbridge sees both the pluses and minuses of UNIX systems. "One of the advantages," he explains, "is that it opens up the market for commodity products." It also opened up the AA to problems, particularly in the area of multiprotocol communications. "I wouldn't say it's been a smooth road," says Strawbridge. "We've had to invent a lot of software."

Although most organizations using UNIX report success, some are looking for improvements. Security EDP, which

Where UNIX is Running in Europe

UNIX scored its biggest hit on the desktop.

Systems	1988 Shipments	% Increase	Main Suppliers
PCs/Workstations	4,000	48	Sun, HP
Small Multiuser	55,000	29	NCR, Alto Siemens
Medium Multiuser	80,000	45	Nixdorf, Siemens

Source: International Data Corp.

loves UNIX's portability features, isn't pleased with the discrepancies among the various software releases. The company also found the UNIX workstations more difficult to learn to use than ordinary PCs and plans to add more applications to enhance user friendliness.

Leeds, U.K.-based law firm Booth & Co. also points out some drawbacks.

> ☐ **WHERE THE PUBLIC SECTOR GOES WITH UNIX, THE PRIVATE SECTOR FOLLOWS.**

Booth's UNIX systems—from vendors Convergent Technologies Inc., MIPS Computer Systems Inc. and Motorola Inc.—are used mainly for OA applications. The company would like to use AT&T's RFS distributed file system extensions in UNIX V3. Unfortunately, its five Convergent S/320s currently only run V2. "We can't make the network look like one big machine," complains Dominic Hayes, a development analyst at Booth. "V3 has been out for a year, and we're still waiting."

Despite this complaint, Hayes is pleased with the performance and security of the UNIX environment. In terms of importance, Booth rates peripherals availability over portability. "If we want to change a screen, it's a fairly simple matter," he says.

The PAC survey showed that French users felt that UNIX's biggest shortcoming is its lack of facilities for integration with other systems. "There are great opportunities for software houses in everything that concerns integration of UNIX into the non-UNIX environment," says PAC's Cedric Thomas. Already taking advantage of this opportunity are European system and software houses such as the Sema Group PLC and Cap Gemini Sogeti in France.

Other Continental vendors are equally hungry for a slice of the European UNIX market—a market that was estimated at around $3.7 billion last year. That $3.7 billion actually represents roughly one-third of the total worldwide market.

The European market for UNIX wares is currently growing at a fast clip of 40% a year, according to Framingham, Mass.-based International Data Corp., which expects that growth to slow to between 10 and 15% by 1993. But UNIX, is certainly much more than a mere market to many. "UNIX is not a market," insists PAC's Thomas. "It's a tool." Today users in Europe have already begun to wield that tool to help shape their IS environments of tomorrow. ▭

Based in London, Peter Judge is a freelance technology journalist specializing in open systems.

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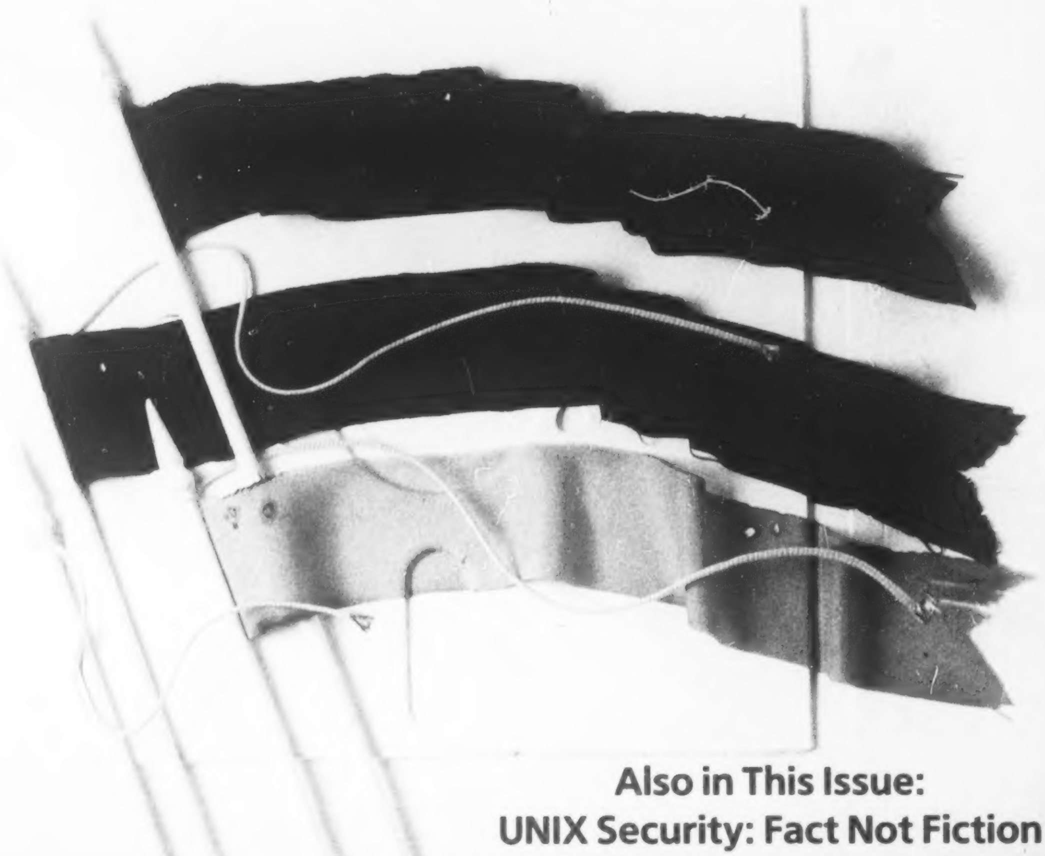
THE SOFTWARE REVOLUTION

How IS Executives Are Changing The World of Software Development



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Maintaining the Competitive Edge

The IS Engine Driving Infiniti

The World Bank's Open Network

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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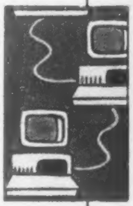

BY LARRY OSTROFF Rohm and Haas' IS staff has woven together systems to create a strong electronic fabric that's enhancing the chemical company's business performance on far-flung foreign shores.

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Change for the Sake of Productivity

Revolutions come in all stripes—political, social, industrial, scientific, etc. All except a few revolutions, such as those events unfolding in Eastern Europe, are visible only in hindsight. When we're caught up in a revolution or on the sidelines of one, we hardly know it until a *Newsweek*, *Fortune* or other popular media outlet tells us so, usually well after the fact.

The ability to see economic and technological revolutions as they are happening is an important quality in any manager. The intelligence to decide whether his or her organization should participate in them and the will to do so are even stronger assets. For example, those executives and organizations who foresaw the revolution in financial services that occurred in the past decade were, for the most part, aptly rewarded.

In the IS sphere, the rewards seem bountiful for those managers who recognize that there are, indeed, fundamental changes taking place in the creation and maintenance of applications—the very heart of so many of today's information technology-intensive organizations. In our cover story, "The Software Revolution," senior writer Jeff Moad examines the scope of the movement to transform the design and support of software applications from a craft to a discipline. It's one that may transform organizations that embrace such discipline into much more productive enterprises in nearly every facet of their operations.

Moad's exhaustive research, involving scores of interviews with *Fortune* 1,000 companies and with software suppliers, took him far deeper into the subject than any DATAMATION editor had comprehensively probed before. He talked to chief information officers who are hounded by their companies' chairmen to improve software productivity as well as to the individuals charged with seeing that sought-after productivity gains are realized. The titles of users who appear in the cover story—like data analyst, director of data resource management, corporate software manager and data center director—evince the depth of Moad's reporting.

Photograph by David Bradley

MOAD: Examining the software design discipline.

As revolutionary as is his subject matter, Moad's conclusion is probably one that has been repeated time and again—in different centuries and in different businesses: the tools are at hand, but the will to use them is lacking. Moad finds that although products and techniques like as computer-aided software engineering are advancing fast enough to enable a true revolution in software development, what's in short supply at all but the exceptional user organizations is the management foresight and IS culture to bring about such change. "For most companies," he writes, "reality is lots of installed applications, an entrenched way of developing new software and management that may not be willing to pay the price of upheaval and uncertainty in order to get a new automated software development process."

For the sake of more productive enterprises, users should be willing to pay such a price. The cost of avoiding the revolution will certainly be much higher.

A Model for Systems & Strategies

Joining Moad on the trail of revolutionaries in this issue is Dallas bureau manager Bob Francis. In the third installment of our Systems & Strategies series, Francis studies what's behind the hottest buzzword of the new decade—client/server systems. In "Client/Server: The Model for the '90s," Francis positions PCs, workstations, local area networks and servers for users who seek to take advantage of such distributed computing power.

Tim Mead

Tim Mead, Editor in Chief

DATAMATION

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Maintaining the Competitive Edge

Why are IS managers paying maintenance new respect? They're spending as much as 80% of software resources on keeping existing programs intact, and they're determined to see maintenance as a strategic tool.

BY JEFF MOAD

Traditionally, management at most companies has thought very little about the people who keep the software working. CEOs, CIOs and the like have been far more interested in the whiz-kid programmers who were developing the applications of tomorrow.

Lately, however, companies are finding themselves up to their elbows in unpleasant software maintenance consequences. The chore of fixing and upgrading aging applications software programs—which have grown to millions of lines of code in some cases—now eats up the lion's share of total software resources at most corporations. In fact, in some organizations, the maintenance burden has grown so large so fast that there is little if any money left over to develop new applications.

"We're doing virtually no new development anymore," says Gail Morden, systems program manager for the Federal Home Loan Bank in San Francisco. As the agency that regulates the besieged thrift industry nationwide, the bank has seen requirements for its existing applications change radically in the last year. "As a result, all we're doing is maintaining and enhancing applications and buying some off-the-shelf software as we need it. We've turned into a maintenance shop," Morden says.

Most companies spend 60 to 80% of their software budgets on maintaining existing applications, according to industry experts, whose definition of maintenance includes updating as well as fixing bugs in existing applications. Stamford, Conn.-based Gartner Group Inc. estimates that U.S. corporations spend $30 billion annually on software maintenance. The market research firm further calculates that fixing and reengineering existing applications will consume 90% of IS software resources by 1995.

With such high stakes, it's no wonder that companies are taking a hard look at their software maintenance operations. Large companies in information-intensive industries such as insurance, banking and telecommunications are intent on cutting maintenance bills. But they're also determined to regard maintenance in the same way they treat software development—as a tool for gaining a competitive edge.

Achieving such status means that companies must change the image of software maintenance as a dead-end activity performed only by programming rookies and development washouts. To do so, many are attempting to:

- Lure some of their best programmers into maintenance by providing improved working conditions, attractive career paths and even pay bonuses,
- Refine their software maintenance organizations, and
- Develop computer-aided software engineering (CASE) platforms that incorporate maintenance tools and software reengineering techniques.

At some companies, the push to improve software maintenance has led to a full-fledged "be kind to maintenance programmers" movement. At the re-

ROYAL BANK
Cash Counter
BANK
Updater
Plus
Interac
VISA

ROYAL BANK'S DIXON: Management at Canada's largest bank redefined maintenance to include only correcting errors and making minor enhancements costing less than $50,000.

Photograph by Ottmar Bierwagen/Black Star gional Bell operating company U.S. West Inc., for example, IS managers and consultants recently met with 1,000 to 1,200 maintenance programmers located across the western United States. During the three-day road show, managers gave awards to outstanding maintenance programmers and collected suggestions that would help the programmers be more productive. Among other things, the programmers said they wanted flexible work hours and easier transfers between groups. Management of the Englewood, Colo., company promised to deliver.

U.S. West has also begun awarding maintenance programmers spot bonuses as recognition for outstanding performance—not to mention motivation. And the company has made organizational changes, splitting maintenance away from development. The move allows the company to focus on maintenance and to keep the growing maintenance activity from overwhelming development, which now accounts for only about 15% of U.S. West's software spending. "It's difficult to worry about tomorrow when you're drowning today," says Jim Shelton, U.S. West's director of systems development and maintenance, in explaining why the company devotes so much of its resources to maintenance.

This new focus on software maintenance is something long past due. For years, say maintenance professionals, IS management has showered new applications development with lots of attention and the latest in new tools, while viewing maintenance as a necessary, though not particularly critical, function. Management was often slow to invest in advanced maintenance tools such as test coverage analyzers and source-level debuggers. For programmers, a maintenance assignment has often been viewed as a path to nowhere. "It was a dead stop," says Judith Marx Golub, president of the Staten Island, N.Y.-based Software Maintenance Association. "Management always looked to the development people and made them managers, not the maintenance people."

☐ **INFORMATION-INTENSIVE INDUSTRIES ARE INTENT ON CUTTING MAINTENANCE BILLS.**

Experts also blame academia for the second-class status to which maintenance has been relegated. Robert Glass, editor of "Computing Trends" of State College, Pa., says, "Most universities are doing almost nothing to prepare programmers to do maintenance. Academics think you can learn enough about maintenance by learning development, but it's just not true."

Ironically, says Glass, IS managers' infatuation with software development had led them to assume all was well on the maintenance front. That assumption has been challenged as the maintenance function at many companies gobbles up more and more resources—in some cases limiting new development efforts. "As they see less and less development going on, management is trying to understand what these [maintenance] people are doing. They're finally taking an interest," says SMA's Golub.

Controlling Maintenance Costs

IS executives at The Royal Bank of Canada are certainly keeping an eye on maintenance dollars these days. Keeping the Toronto-based bank's massive, aging systems working and up to date has taken a larger and larger maintenance staff over the years. "About two years ago, management looked at the growing amount of resources that were being chewed up by maintenance," says retail banking systems manager Doug Dixon. "They concluded that people were being added, but they weren't sure what return they were getting."

They soon found out and, as a result, redefined maintenance at the bank, Canada's largest. Like many companies, the Royal Bank discovered that the fastest growing and most critical piece of its maintenance effort was not tied to what most people think of as software maintenance: fixing problems in existing programs. Rather, it was spending lots of maintenance dollars to add significant new functionality to existing applications.

"We wanted to make sure the rest of the bank understood that what we were doing was really creating new function and new value, not just fixing bugs," says Dixon. So IS management redefined maintenance to include only correcting errors and making minor enhancements, typically costing less than $50,000. The rest of the function—making major enhancements to applications—was reclassified as development and subjected to the same rigorous cost-benefit analysis and service-level agreement process as a new application development project. Such scrutiny helps account for and justify some of the larger expenditures that had previously been loosely lumped under maintenance.

To keep maintenance programmers happy and encourage good development

Maintaining a Competitive Stance

Here's what three leading users have and what they're doing to make sure they're ahead of the pack on managing software maintenance.

U.S. WEST

- Conducts management road shows for programmers;
- Gives awards, including bonuses, to outstanding maintenance staff;
- Seeks input from programmers on how to improve workplace conditions;
- Split maintenance from development.

ROYAL BANK OF CANADA

- Redefined maintenance to include only correcting errors and making minor enhancements (less than $50,000);
- Reclassified major applications enhancement as development;
- Subjects the function to more rigorous cost-benefit analysis;
- Measures the effectiveness of maintenance, based largely on numbers of errors and system uptime;
- Pays programmers bonuses of up to $3,000 per year for meeting given performance levels.

MASS MUTUAL

- Requires programmers with management ambitions to spend some time in its maintenance organization;
- Has shortened the time it takes for maintenance programmers to advance to business analyst positions from seven years to three years;
- Conducts self-critiques and sends them to end users;
- Reports on planned changes to end users.

programmers to consider maintenance, companies are also trying to develop clear career paths that include maintenance. Boston-based Massachusetts Mutual Life Insurance Co., for example, now requires programmers with management ambitions to spend some time in maintenance. The company has also created an analyst development program as a way for maintenance programmers to move into consultant-like business analyst jobs in three years. In the past, it has taken approximately seven years for maintenance programmers to move up.

Setting A Career Path

"Management here is particularly sensitive to the fact that product support is the lifeblood of our business," says Jeff McEwen, Mass Mutual's director of system resource development. "To a large extent, our products revolve around information, and we have to support it with professional software maintenance."

Mass Mutual also seeks to build stronger bonds and better communication between software development and maintenance organizations. Each year, the company's maintenance team evaluates its performance and reports on planned changes—and it sends the reports to its clients.

In the long run, says McEwen, technology may further blur or even erase the line between development and maintenance. To the extent that CASE technology allows programmers to work exclusively at the requirements and specification level, there will eventually be little difference between maintenance and development.

☐ I HAVE WANTED TO BELIEVE IN REVERSE ENGINEERING, BUT I JUST DON'T.

"In the future, we think the roles of maintenance and development will merge," says McEwen. "With new tools like code generators, everyone will be going back to the specification level to make new applications or changes anyway."

Toward that end, Mass Mutual and many other companies are currently mapping out advanced CASE development environment strategies, aimed at enabling them to manage the full life cycle of their applications. Mass Mutual calls its approach the Existing Application System Environment. So far, the company has settled on Texas Instruments Inc.'s Information Engineering Facility (IEF) CASE product for overall life cycle management. The company is currently evaluating maintenance tools that can fit into the IEF framework.

IN THE LONG RUN AT MASS MUTUAL, technology will further blur the line between development and maintenance.

As they attempt to build on CASE to solve their maintenance problems, companies like Mass Mutual are discovering a harsh reality. To date, CASE vendors have largely been unable to satisfy maintenance programmers' greatest need: products that can be used to reverse engineer existing applications to take advantage of advanced CASE design, analysis, code generation and life cycle tools. Maintenance programmers complain that, so far CASE vendors such as TI and IBM have focused almost entirely on upper CASE tools for new application development. Upper CASE features include planning and analysis tools that help developers draw a picture of how an application should be structured. Lower CASE products are actually used to create the code at the heart of an application.

Reverse Engineering Engines

Although some vendors such as Burlington, Mass.-based Bachman Information Systems Inc. are marketing products for data reengineering, no one has solved the problem of reverse engineering existing applications. "So far, the whole CASE emphasis has been in the wrong place," says the Federal Home Loan Bank's Morden. "Maintenance is 80% of what we do, but the vendors have insisted on addressing only 20% of the problem—the development side."

IBM's recent AD/Cycle CASE announcement, for example, included only two maintenance-oriented tools—a test coverage analyzer and an interactive test tool—in addition to the Bachman data reengineering tool set. Analysts such as Gartner Group have called the offering woefully inadequate. IBM officials even acknowledge that, so far, AD/Cycle has only scratched the surface of the maintenance problem. "It's a starting point," says Denis Clark, IBM director of application enabling software marketing. "What we're delivering today is a starter set of some of the things we feel we can deliver. . . . It's not perfect at this stage."

One reason why CASE vendors apparently lack interest in maintenance is, again, the area's history as a second-class function. "Traditionally, most users have set aside practically no budget to buy maintenance tools," says Vaughn Merlyn, president of CASE Research Inc., a consulting firm in Bellevue, Wash. "That may be changing, but many CASE vendors see maintenance-tool vendors struggling to survive, and that reduces their motivation to invest in the maintenance side."

IBM's Clark concurs. "They [customers] do tell us they're putting a lot of resources into the maintenance, but at the same time what they're telling us is that they're not making a dent in the application backlog. That has nothing to do with maintenance."

Users, however, say that until CASE can address all of their software problems, including maintenance of existing applications, they're likely to focus on management solutions and existing tools rather than buying into CASE. "Until they [CASE vendors] can do that, it's just another new technology we've got to learn in order to do what we're already doing," says Dennis Hobbs, manager of systems support at Alberta Government Telephone in Calgary, Alberta, Canada. His is another company attempting to upgrade the status and efficiency of its maintenance operations.

Although vendors admit that CASE hasn't yet offered much in the way of helping to maintain existing applications, they insist they are working hard to come up with tools. High on their list are reverse-engineering products that assist in analyzing existing code to reconstruct original source information and specifications that have long since been lost or forgotten. Once reconstructed, those specifications can be fed into a code generator, which would reproduce the application in new and improved structured form either in COBOL or in the programmer's fourth-generation language of choice. Among vendors who have major efforts under way to develop such tools are Bachman Information Systems, Language Technology Inc. of Salem, Mass., and Transform Logic Inc. of Phoenix.

Although reverse engineering sounds easy, it represents a major technical challenge. Experts are evenly divided over whether that sort of reverse engineering is possible and just how automated it could be. Language Technology chairman Eric Bush has said it's only a matter of time before someone perfects automated reverse engineering of existing COBOL programs. But Bachman Information Systems founder Charles Bachman says there will always be some degree of programmer involvement. He predicts that usable reverse engineering tools are five years away.

CASE Research's Merlyn, meanwhile, will have to see reverse engineering to believe it at all. "I have wanted to believe in it, but I just don't," he says.

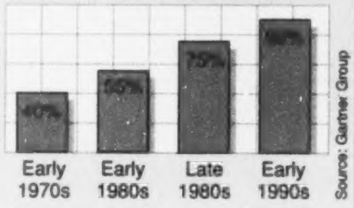
Even if automated reverse engineering proves to be an idea whose time has not yet come, some vendors are having success bringing existing maintenance tools into the CASE world. Viasoft Inc. of Phoenix, for one, is marketing its own repository supporting a powerful parser and set of maintenance and analysis tools to automate a large portion of the maintenance and enhancement job. According to Viasoft president and CEO Kent Petzold, several CASE vendors are vying to incorporate Viasoft's repository and toolset into their environments.

Until more vendors take such steps to deal with growing user concerns with software maintenance, the CASE market may not take off. "Users are realizing they've got to find some way to deal with the mess created by existing applications," says Geoffrey Barnes, a director for the consulting arm of Cap Gemini America in New York City. "CASE is one potential way to do that, but users are saying to the vendors, 'You've got to prove that it works for maintenance first.' Right now, the answers aren't there yet." ▭

The Meteoric Rise of Maintenance

Unless maintenance is managed, it could consume nearly all of a users' software resources.

PORTION DEDICATED TO MAINTENANCE



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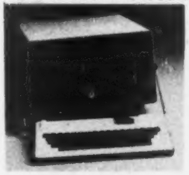

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One Sure Way To Boost Your IS Paycheck: Jump

Should you leave the safe haven of a small pond for the adventure of the big information systems ocean? The rewards may be worth the risk.

BY MADELINE FRANCHI

Information systems professionals at companies with 1988 gross sales of $3 billion or more earn a higher average base salary than do their counterparts at user organizations with sales under $1 million, according to the 1989 DATAMATION IS Salary Survey. Salient findings of the survey, which was based on replies from 344 IS executives, were revealed in our October 1, 1989, issue. Nitty-gritty details from the survey appear here and will be further scrutinized throughout the year.

The difference in average salaries at the big companies relative to the little companies range from 10% more for a consultant to almost 200% more for a director of IS. For 35 job categories in the study, the average IS employee in the larger setting grosses 71% more pay than the worker in smaller organizations.

For the most part, the largest salary differential exists for corporate staff, whereas professionals in data entry and word processing see the smallest differential between big companies and small. As a group, for example, vice presidents of IS, directors and technical services managers at large companies maintain average base salaries 2.6 times the salaries of their colleagues at small firms. By comparison, the average salaries for data entry and word-processing supervisors and operators in large firms are only 1.4 times higher than those of their compatriots in small ones.

Professional Development

Not only do large companies write bigger paychecks but they appear to invest more in their IS employees, too. Nearly twice as many large companies as small companies spend $2,000 or more in training or retraining their IS employees—44.4% of large companies do, but only 23.4% of small companies invest so much. Not that big companies are without their faults—nearly 17% of big firms budget zip for IS training. Still, that's a far better track record than small firms—as many as 37% of such companies have no budget at all for education.

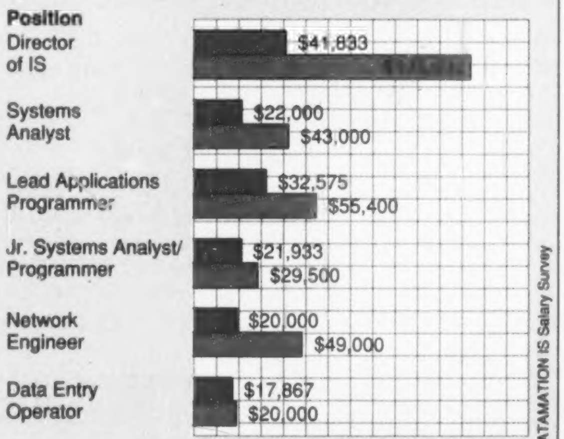
Look before you leap, however. As alluring as the fat paychecks promised by big companies appear to be, subsequent raises aren't so attractive—at least in percentage terms. Last year, notably, most IS executives at big companies expected to raise their staff's salaries by 1 to 5%. Their counterparts at small organizations had bigger rewards in mind—budgeting 6 to 10% pay hikes in a majority of cases. If pay raises go according to expectations, average salaries for some job categories may begin to even out across companies—big and small.

Before jumping into the big time, remember that a number of factors, not just gross sales of an organization, influence pay scales. Geographic location and industry segment also influence pay hikes. Big IS bucks are easier to make on either U.S. coast than in the hinterlands. And the paychecks are fatter in consumer-goods manufacturing, transportation and utility companies than elsewhere. ▭

More economic information can be obtained from Cahners Economics Department, 275 Washington St., Newton, MA 02158, (617)-964-3030.

Where the Bucks Stop and Start

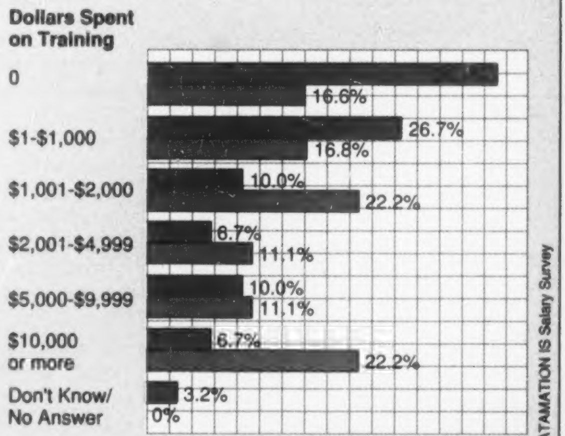
Don't kid yourself. If you're at a small organization, you're probably not making as much money as your peers at big firms.



Source: DATAMATION IS Salary Survey

Where IS Training Is Intense

Not only are you likely to improve your pay at a big company but you may also benefit from more and better training.



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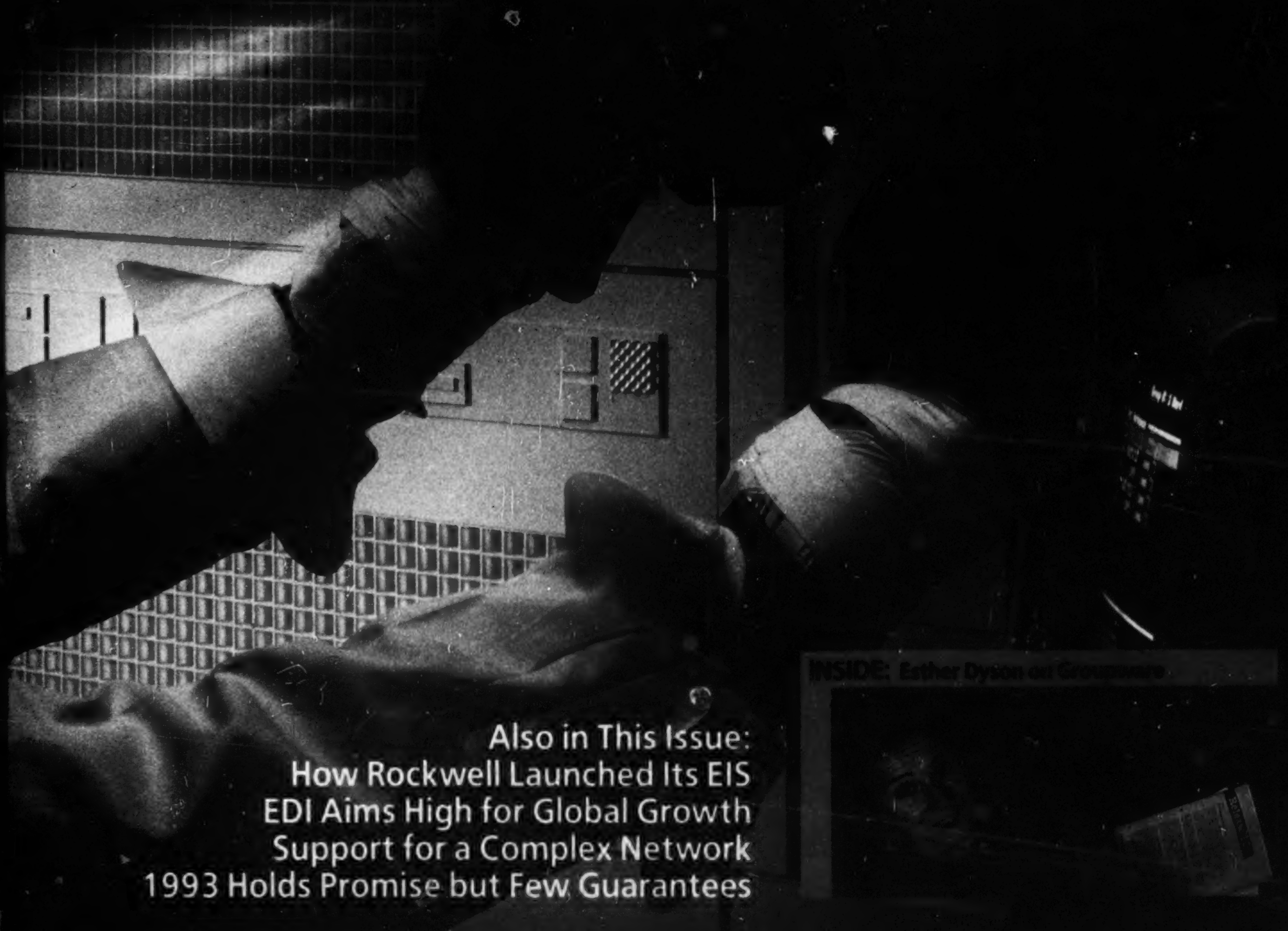
SYSTEMS & STRATEGIES FOR THE '90s—New Allies: IS and Service Suppliers

DIGITAL'S FIGHT STRATEGIES

DEC Dukes it Out on the High End, But Ducks the Competition on the Desktop



INSIDE: Esther Dyson on Groupware

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How Rockwell Launched Its EIS
EDI Aims High for Global Growth
Support for a Complex Network
1993 Holds Promise but Few Guarantees

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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Patrick Gross of AMS views outsourcing as a trade-off between control and greater impact on business.

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Servicing the IS Enterprise

So many workers have the ability to create, alter and use information with the touch of a keyboard as to render the best IS plans useless. So many executives and administrators have such a need for real-time information to operate their enterprises efficiently as to drive the staff mad. So few enterprises have the luxury of ignoring the IS pressure because many rely on the distributed networks of systems for the very revenues they generate. One only has to look back to the damage caused to so many U.S. enterprises when the nation's major long-distance carrier lost network control for several hours.

McMULLEN: Looks at efficiency.

SIVULA: Digging at Digital.

Photographs by David Bradley

Choosing partners to help manage such enterprises, therefore, carries much more weight today than it did when stand-alone systems were the norm. That's why DATAMATION investigates two kinds of partners—a systems company and a field of IS service providers—thoroughly in this issue. In our cover story, "Digital's Fight Strategy," we examine whether the world's No. 2 computer maker, Digital Equipment Corp., can indeed serve the enterprisewide IS needs of major user organizations. In our special report, "New Allies: IS and Service Suppliers," we study the motives of users choosing to outsource a greater amount of their IS functions and those that are increasingly tapping information services databases for business-critical information.

Neither pursuit is gilded. In looking at Digital, Boston bureau manager Chris Sivula finds the company's strengths and its weaknesses. His conversations with customers, competitors and critics of the company disclose progress at the high end of Digital's product line but also reveal serious doubts about the company's low-end strategy. The company, Sivula concludes, must improve its hardware, software and desktop strategy. His report on Digital, our third major profile of the company in three years, should help you decide whether it's making the sort of improvements needed to serve your enterprise.

Finding Efficiency on the Outside

In tackling the entire information services industry, John McMullen weighs the pluses and minuses of relying on outside IS help. As part of our Systems & Strategies for the '90s series, associate editor McMullen looks at why users are increasingly turning to systems integrators and on-line database companies to help run their enterprises. Efficiency, he finds, is the chief objective of companies choosing to outsource programming and other critical IS tasks. "Bottom-line senior executives . . . are driving the outside services trend," says one executive.

McMullen's personal and telephone interviews with users and service suppliers took him from Jack-in-the Box restaurants in San Diego to a corporate boardroom in New York. The latter belongs to Dun & Bradstreet Corp. chief executive officer Robert Weissman, whose conversation with McMullen about the direction of the information services industry is as revealing as any you'll see. The role of D&B, DATAMATION's former owner, and other IS service providers in keeping your enterprise competitive cannot be underestimated.

Tim Mead

Tim Mead, Editor-in-Chief

DATAMATION

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COVER STORY
OLTP

ROUND 1
DIGITAL'S
FIGHT
STRATEGIES

Duking It Out on The High End

Digital's thrust into transaction-intensive markets like retail merchandising, banking and insurance is just getting off the ground. But to fly, the company must address a variety of hardware, software and marketing needs.

BY CHRIS SIVULA

Craig Pavilus, the president of TWA Getaway Vacations Inc., was looking for a new reservation system. With an all-IBM shop, Pavilus wasn't thinking about considering Digital Equipment Corp. as a supplier. But one day his thinking changed.

"What started the whole thing for me was this Digital salesperson," recalls Pavilus. "His name is Carey Stronich. He sat outside in the reception area on our executive floor for six hours and wouldn't leave. He wanted to tell me about the system. He was the person that really cracked it for me.

"He tried to find out what the business need was, why did I want it [the reservation system] and what did I want it to do. When I described it to him, he disappeared. When he came back, he said, 'Here are some companies that can accomplish what you want done,' strictly from a software and applications side."

Mt. Kisco, N.Y.-based Getaway Vacations ended up with Autofile Inc.'s tour reservation package on a VAX 8500. The VAX-based system, connected via Digital's Ethernet technology, is linked to the corporate IBM system's Token Ring network. There was some grumbling at Getaway's IS department regarding the VAX system's ability to access data from the corporation's IBM mainframe, but, according to Pavilus, the problems were part of a normal shakedown period.

Getaway changed the way it sells tours last year. The company had been offering inflexible packaged tours, but now sells custom-tailoring arrangements for hotel, travel and other vacation services. The business just couldn't wait for a system that could handle the new complexities, according to Pavilus. "Since October, our business has been up 40% each month in terms of bookings," he says.

Digital likes to point to the TWA Getaway account as an example of the way it's finding opportunities in new markets. But for Digital to enjoy anywhere near the growth rates it has achieved over the past few years, it will have to rack up a lot more wins like Getaway.

In the 10 years between 1979 and 1989, Digital went from $1.8 billion in annual revenues to $12.7 billion, a hefty compound annual growth rate of almost 22%. But that rate slowed last year, dropping to a mere 9% increase and actually declining 2% at the end of the second quarter of fiscal year 1990. Profits last

TWA GETAWAY'S PAVILUS: The Digital system enabled Getaway to offer flexible vacation service packages, resulting in a big jump in bookings.

Photograph by Allen Orling

One problem holding back potential customers is that Digital isn't offering a consistent migration path.

year declined for the first time since 1983, with net income for the year at just over $1 billion, compared with $1.3 billion for the previous year. At the end of the second quarter of FY90, profits were down 44% from the same period of the previous year.

To grow, Digital must find new markets. To do so, it is trying to accelerate its evolution from a midrange supplier of boxes for departments and factories to a broad-based provider of integrated systems to commercial markets—in particular, largely transaction-heavy markets like travel, retail merchandising, banking and insurance.

Discussions with users, consultants, analysts and Digital officials reveal that to succeed in reaching these new commercial markets, Digital needs to make improvements in hardware, in software and in its desktop strategy. The company must also develop new skills in the areas of marketing sales, service and support.

If all goes according to plan, Digital will take steps this week to address those needs on the product side of the house. Expected improvements include the announcement of fault-tolerant capabilities for the VAX line of computers, two-phase commit software (necessary for distributed databases) for Digital's proprietary operating system VMS and new forms-processing features that can bring Digital closer to its goal of fully integrating its two transaction-processing monitors, ACMS and DECintact.

Digital is hoping the announcement will go a long way toward silencing critics who say the Maynard, Mass., computer maker doesn't have either the database technology or the on-line transaction-processing capabilities necessary to compete for commercial markets against the likes of Tandem Computers Inc. and IBM.

"Almost all the criticisms that are being leveled—that we don't have this and that—well, now we've got it all," says Bob Glorioso, vice president of the Information Systems Business Segment, Digital's new name for its high-performance systems group.

"If you want a fully distributed, high-performance, high-availability, commercial transaction-processing application and you wanted it to play in nine to 12 months, which is typically what it takes for a large application, then we can deliver it," Glorioso says.

Making the Move Into New Markets

It has been almost three years since Robert C. Hughes, vice president for service industries marketing, sold Digital on the idea of targeting vertical markets like the travel industry as a way to reach beyond its traditional technical, engineering and factory automation arenas. One of his first steps to further the strategy was to bring in Peter Robohm, then-manager of IBM's information systems group.

In April 1987, Robohm was named director, general service industry. He was given responsibility for nurturing the wholesale, retail and freight distribution market, the travel service industry and the utilities market—which Robohm calls "greenhouse" markets, those that Digital has not much penetrated. Digital estimates that in the United States alone, those industries spend $30 billion on data processing each year.

DIGITAL'S GLORIOSO: Orders for the 9000 mainframe have spanned the business world, including the auto industry, utilities, health care and banking.

Photograph by David Bradley

The concept, explains Robohm, is to cultivate new markets into saplings, pass them on to other marketing groups in Digital and then take on new markets to start the process over again.

Digital says it's too soon to move any of these new markets out of the greenhouse, but Robohm's group is apparently making some headway. Although it considers exact dollar figures proprietary, Digital claims to have increased revenues by 20% to 40% in 1989 in these new markets, enough success to warrant the addition of some established markets to

Digital's Profile

After years of over 20% growth, Digital Equipment Corp. slowed down somewhat in FY89; the $12.7 billion in total revenues represents only a 9% gain from FY88.

- Product Sales: $8.2 billion
- Service and Other Revenues: $4.5 billion
- Cash Assets: $1.6 billion
- Research and Engineering Expenses: $1.5 billion
- Number of Employees: 125,800
- Workstations Sold Last Year: 50,000
- Total VAXs Sold: 300,000
- Total VMS Users: 8 million

Robohm's group—health care, education, and state and local government.

Robohm went out and hired new expertise, mostly former IS directors from the industries his group is targeting. His marketing staff cultivated independent software vendors to port applications to VAX machines; outside consultants were brought in to train the staff on the nuances of the specific industries.

"Our focus was to see if we could understand what the markets were, to understand what the problems were that kept the senior officers of those companies awake at night and procure, one way or another, those applications," Robohm says.

With a few victories like Getaway Vacations under his belt, Robohm says Digital's upper management started looking at his organization seriously.

Robohm's efforts haven't stopped criticism from outside the company, however. "When they get into these very sophisticated markets like OLTP, they'll need to have very competent salesmen," says James Johnson of the Standish Group International, a Hyannis, Mass.-based consulting firm.

Johnson is among those who view the departure last fall of Jack Shields, the executive who built Digital's marketing and sales organization, as a serious blow to the company's plans to increase its share of commercial markets. Shields joined Prime Computer Inc. as president and chief operating officer in January. At the end of a one-year transition period, Shields becomes CEO of Prime.

At any rate, Digital has acknowledged that there is room for improvement in its sales and marketing efforts. The company took several steps to strengthen these areas in the past year, including sending some 7,500 salepeople to summer school.

Digital also reorganized its marketing staff late last year, putting a single person in charge of each major account. As a result, major users no longer have to work their way through Digital's bureaucracy; instead, a user calls the assigned account executive who acts as a liaison to the rest of the company.

Such efforts haven't satisfied all critics, however. "The big problem for DEC is to become a market-driven company," Johnson says. "The absence of Jack Shields is going to have a major impact. He was one of the few souls at Digital to pop his head out of the engineering cocoon and see what the market wants."

"Until a few years ago, I think that argument against them was valid," says Dennis Healy, vice president of MIS for Paramus, N.J.-based Toys "R" Us Inc. His company uses about 1,000 MicroVAX IIs as point-of-sale controllers in its 400 toy stores.

"They never even came out and sold you anything. It was like going to Radio Shack—you had to know what you wanted, and you called them and they might answer the phone. You would order exactly what you wanted, and they would ship it," Healy says.

"In the past few years, though, they have made a concerted effort to become more of a traditional—like IBM or Unisys—service and software kind of company; a come-out-and-talk-to-you type company," Healy says. "They have done that very well."

For example, says Healy, Toys "R" Us does about half of its annual business in the month between Thanksgiving and Christmas. During that time, Digital keeps a couple of its people stationed at the Toys "R" Us to help with any technical problems that crop up.

Of course, Toys "R" Us is a major account. It's 15 years old and generates in the neighborhood of $35 million in revenues for Digital each year. Naturally, it gets a lot of attention. But, overall, support for large commercial accounts is still a struggle for Digital, says Glorioso.

To the Database Victor

The world, according to Digital Equipment Corp., is moving away from the centralized mainframe toward a distributed model of computing. That means the time is ripe for Digital to start providing large, commercial transaction-heavy systems, says virtually everyone at the company, from founder and president Kenneth H. Olsen on down.

But according to many observers, whether or not Digital realizes its ambition depends on the success of Rdb, its relational database. Most transaction-processing applications draw on large databases and, last year, Digital began bundling a run-time license for Rdb with VMS, its proprietary operating system.

That move is an indication of how important it is to Digital that users accept Rdb, according to Dennis Vohs, chairman of Ross Systems Inc., a Palo Alto software house specializing in financial applications for VAX systems.

Digital is pushing Rdb because it can't hope to develop a truly distributed database system unless it controls its customers' existing databases, Vohs says. The massive development effort needed to provide a smooth migration to a fully distributed database isn't possible using third-party relational databases.

Enhancements last year, particularly in the ability of Rdb to utilize multiple disks, have impressed Roy Shulte, an analyst at the market research house Gartner Group Inc. "At this time, I would still characterize Rdb as lagging the leading third-party databases overall, but I would guess that it's only a year behind the other databases now, as opposed to being two or three years behind. DEC has really closed the gap considerably in the last year," he says.

This week, as part of Digital's effort to make Rdb suited for distributed computing applications, Digital is announcing two-phase commit software, which allows a single application to use data residing on multiple machines as if they were one computer. Digital is hoping that two-phase commit will bring Rdb closer to the sort of acceptance it's seeking in the commercial transaction-processing marketplace.

The technology is essential to building a fully distributed database, because two-phase commit is necessary for full recovery if one machine in the network fails.

But it's not all the technology that's necessary. "I don't think that anybody who isn't lying can claim that they have solved the recovery problem in a distributed database environment," says Tim W. Tyler, vice president of sales and marketing for SmartStar Corp. The Goleta, Calif.-based software vendor sells a fourth-generation language product for VAX systems. "Just having a two-phase commit is not enough," Tyler says.

Since no one can deliver a fully distributed database today, Digital is on par with other vendors, Tyler says. "I would be

Digital's made a concerted effort to become a come-out-and-talk-to-you type company.

"We have a new set of applications to support," Glorioso says. "We've got to build up our support capabilities, particularly in large system installations, development and maintenance."

Still, Digital is making strides, Glorioso says. The company began training staff to support high-performance systems about four years ago. He estimates that about 1,000 Digital employees are now skilled in transaction-processing and database technologies and another 200 to 300 are what he categorizes as "top gun" experts.

Digital is also taking on partners from the consultant community to help provide the sort of services that the commercial market requires. Alan Ross is national director of the DEC System Integration Group at Price Waterhouse in New York City, one of those consulting firms.

In his role at Price Waterhouse, Ross helps companies implement Digital systems. And he's raising questions about Digital's attempt to provide large-scale, high-performance systems.

"I focus primarily on the commercial side. In that area, there is no question that OLTP appears to be the biggest issue," he adds. " 'What's my high-end costs and what's my low-end costs?' That's the first thing a corporation asks. When you get to 40 transactions per second, Digital is no longer a bargain because it takes too many VAXs to get there," Ross says. "A lot of companies, even with distributed computing schemes, are going to be bumping into 50 transactions per second. Even with a distributed computing style, there's always going to be a division that still has those high transaction rates." The VAX 9000 may bring the high-end costs down, but "a lot of our clients still believe that a big central IBM mainframe best fits their needs," he says.

Too Many Monitors Spoil the Soup

Joseph Payne, a securities analyst for Alex Brown & Sons in Baltimore, is one of the harsher critics.

Payne feels that one problem holding back potential customers is that Digital isn't offering a consistent migration path for its transaction-processing technology. Rather, the company is offering two transaction monitors: the Application Control and Management System (ACMS) and DECintact. ACMS can schedule and control transactions into Digital's relational database Rdb; DECintact only works with DECdbms, DEC's flat file system.

"I've found that customers don't want to be given two different paths, DECintact versus ACMS," Payne says. "They don't want to be told that DEC's going to merge those capabilities down the road and have one monitor—they want one monitor [now]. They want to be told what the architecture direction is, and in that sense Digital is not really clearing up the confusion in their own marketplace about what path they are taking."

Glorioso says Digital is ready to take some of the blame for the confusion surrounding its monitors. There aren't two directions, he says, "But people haven't heard the message, and that's probably partly our fault," he says.

"The thing that two monitors brings to the marketplace is really simple. ACMS provides a fourth-generation-like style of programming, which many customers like, and DECintact brings a COBOL CICS-like style [IBM's Customer Information and Control System] of programming, and there happens to be a bunch of people who know how to program in that style," Glorioso explains.

Eventually, Digital will have one forms-processing technology, one kernel in the operating system for transaction processing and two application-programming interfaces, giving both ACMS and DECintact users a migration path. Included in this

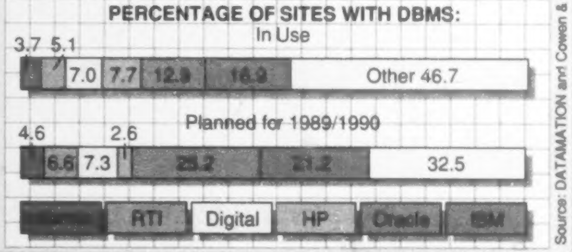
Goes the OLTP Market

able to argue, I think quite strongly, that the last release of Rdb saw it come of age, and that the next release looks like it is going to have the facilities that will make it functionally equivalent—if not ahead—of most of the competitors."

Tyler is skeptical of claims that any relational database has yet captured much of the market for large commercial databases. "Let's keep some perspective here," Tyler says. "In the commercial world, the big databases in the insurance and banking industries are still predominately IMS [IBM's hierarchical DBMS, Information Management System], which comes from the early '60s," Tyler says.

According to Shulte: "Part of the solution is the VAX 9000,

A Long Way From Victory



Digital is not gaining nearly as much database ground as IBM or Oracle.

Source: DATAMATION and Cowen & Co.

another part of the solution is to keep on improving Rdb, and part of the solution is to keep improving their OLTP software."

But, Shulte adds, arriving late to the party is a much bigger problem than any technical issues. "There is the inertia factor. If I'm an insurance company, and I have 5 million or 10 million lines of application code written to run on IBM mainframes—and that would not be at all unusual—I am not going to buy equipment from another manufacturer quickly," Shulte says. "I'm going to go piecemeal and buy one computer for one application now and maybe in a couple of years, if that works out, I'll buy another one for another application. In the meantime, I'm going to keep buying a lot more equipment from IBM than I am from Digital."

That means for some time to come, Digital will remain primarily a midrange vendor.

"DEC has grown into many places," says Gartner Goup Analyst Steve Wendler. "But today, if you ask MIS to identify their enterprise system vendor, the answer is going to be IBM."

DEC isn't there yet. They have neither the raw power, nor the messaged-based operating system capability.

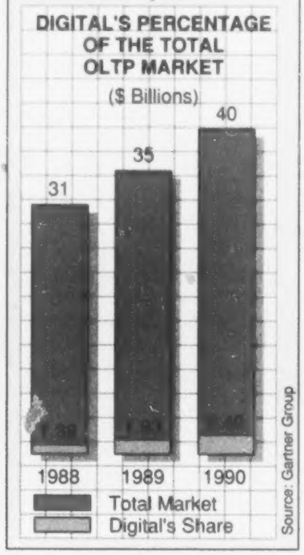
week's announcement, in fact, was notice that the forms-processing software in both monitors would be partially merged.

All that's a game of catch-up, Payne counters. "They're talking about at some point eliminating the need for a separate monitor altogether," he says. "DEC's talking about a new, refined transaction focus in VMS, or maybe a VMS/UNIX-merged operating system for the 1990s. But they're talking about five-plus years. That's a long time."

If Digital may be trying to catch up, as Payne asserts, Tandem is trying to increase its lead in the transaction-processing market. About the same time that Digital introduced the 9000, Tandem was introducing the Cyclone, its own line of mainframes.

Room To Grow

Digital expects to strengthen its narrow OLTP foothold this year.



Source: Gartner Group

Digital's announcement of the 9000 mainframe in the fall has already muted a lot of criticism. The 9000 holds the potential to provide a high rate of transactions per second at a cost that is competitive with other mainframes in the new transaction-heavy markets Digital has targeted.

The new mainframe was the focus of the most recent Digital conference sponsored in December by the Stamford, Conn., research house Gartner Group Inc. "The bottom line of the whole thing was that DEC is doing a whole lot better in the mainframe arena than perhaps anyone had expected," says Cliff Conneighton, program director for office information systems at Gartner.

"Our IBM large systems analysts view the VAX 9000 as a very good, well-balanced machine, completely of the mainframe class, with mainframe quality I/O and with none of the problems in the hardware which some people were anticipating DEC tripping on. None of those problems have surfaced. It's a good, very well-balanced, credible mainframe machine," he says.

"And their plans for the mainframe class operating environment and system management and transaction processing and database appear to be moving in the right direction. While they are not there yet, they know where they need to be," Conneighton adds.

The Question of User Acceptance

Despite the attention the 9000 has attracted, Digital's success in penetrating its new target markets will depend more on users' acceptance of distributed computing for applications that have traditionally run on central mainframes.

Raleigh Federal Savings Bank, moving a mainframe application to midrange machines, is perhaps a more typical example of Digital's new class of users. A service bureau has been providing the North Carolina bank's information system, using a Unisys Corp. A-17 mainframe to handle Raleigh Federal's accounts.

The arrangement was fine while the bank was a typical savings and loan, says John Paschal, information services manager. "Since deregulation has come on the scene, we are moving more toward operating in the traditional banking arena," Paschal says. "The nature of our business has changed quite a bit. We offer many services now that every other financial institution offers, and we are probably more branch oriented than we used to be.

"That's exactly the reason that we felt we had to change our information systems structure. In trying to fill a certain niche in the market, we felt we had to put the data and the data-processing capability out in the branches, where the decisions are made, to serve the customer," he adds. "Going to a more distributed-processing kind of environment, we looked at several pieces of hardware and just felt that DEC provided the easiest way to accomplish our business objective."

The bank plans to use Profile, an integrated banking software package from Sanchez Computer Associates Inc. of Malvern, Pa. Profile will run on a VAX 6310 at the corporate headquarters and on MicroVAX 3100s at each of 33 branches. Tellers will use a combination of terminals and PCs.

With 250 accounts, Sanchez is a leading banking software vendor for Digital platforms. A smaller bank, like Raleigh Federal, that is moving from a service bureau to an in-house system, is a typical customer, according to chief executive officer Michael Sanchez.

But Sanchez sees potential in the 9000 to attract larger customers. "Until recently, we really couldn't go to a bigger bank and tell them to throw everything out, because Digital didn't have a mainframe," Sanchez says. "Now it is just a matter of, jointly with Digital, finding a large bank that wants to invest in that technology. Over the next year, we should find that bank."

Once Digital can demonstrate a few successes and a commitment to the market, more accounts will follow, Sanchez says. Nailing down big commercial accounts depends on the availability of applications from a lot of third parties, however.

In many cases, efforts to attract third parties are working. For example, Ross Systems Inc. of Palo Alto, which sells financial software for VAX systems, uses Rdb as its underlying database. Dennis Vohs, the company's chairman, says he's convinced Rdb will become an industry standard.

If that belief should catch on, Digital just may have a shot at fooling the critics and becoming a real threat to IBM and Tandem in on-line markets. ▭

Next: Digital's reactive strategy for personal computers may either be its Achilles heel or one of the smartest moves it has ever made. Turn to page 36.

ROUND 2
DIGITAL'S
FIGHT
STRATEGIES

Ducking the Competition on The Desktop

Digital's strategy in the PC arena has been to become the integrator of other companies' systems. Is this a smart move or a critical weakness for the company?

BY CHRIS SIVULA

At Coca Cola Foods in Houston, Digital Equipment Corp. had a shot at integrating the corporate office system when the company decided to install an office automation system two years ago. But it looks like those plans have gone the way of New Coke.

"We were at the beginnings of the whole issue of enterprise connectivity," recalls Cheryl Currid, director of applied information technology. "Our original thoughts on what the design would be were that we would run a lot of stand-alone personal-computing applications on PCs and some kind of shared system or office automation system either on an AS/400 or DEC." The final tier would be the corporation's IBM mainframe.

Coca Cola started implementing the office system by connecting local area networks using Novell Inc.'s NetWare operating system. "We never got around to buying the minicomputers," Currid says. Setting out to build a 386-based office system would have been a hard sell, but as it turned out "it just sort of happened," she explains. "We looked, and when the options were laid out it just made a lot of sense to continue building our own system with the LAN versions of some of the PC software."

According to Currid, the LAN-based system is easier to upgrade and maintain than similar systems based on minicomputers. "The biggest advantage is being able to dynamically reconfigure networks, people and software. It's just not difficult to do on a network. We've been able to add functionality to the system that we really didn't know we needed when we first came up."

The experience has been successful enough to prompt Coca Cola to consider other LAN-based systems, some of which could include manufacturing applications. Compaq Computer Corp.'s announcement of its Systemspro network server sparked particular interest, Currid says. Compaq is claiming performance comparable to a minicomputer.

"DEC has sort of stayed away from it. I'm sure they know their business better than I do, but I'm almost surprised," Currid says. "If I were giving advice to DEC, I would probably advise them to test the waters. With all the connectivity they've got, they should be a player in this new world."

How Digital Plays the PC Game

Digital already sees itself as a player. "We have an aggressive strategy that consists of technology, products and services for this marketplace," says John T. Rose, group manager of the Personal Computing Systems Group in Littleton, Mass.

Digital jumped into the fray with its October 1986 announcement of PC integration products and services and has rolled out enhancements about every six months, Rose says. DECnet, Digital's networking architecture, supports MS-DOS, OS/2 and Macintosh systems at the desktop.

VMS, Digital's proprietary operating system, has been under continual development for 15 years. Several hundred million dollars have been pumped into the system. That gives Digital a distinct advantage over leading local area network suppliers like Banyan Systems Inc., 3Com Corp. and Novell, according to Rose.

"Our architecture utilizes any VAX from a MicroVAX 2000 right up to the latest VAX 9000 as a server for the PC. Our server software sits as a layered product across VMS and utilizes all of the aspects of VMS. So, you have security, all of the networking and all of the robustness of VMS," Rose says.

Digital thinks more users will shift to a client/server model of computing and that Digital's PC

COCA COLA'S CURRID: A LAN-based system is easier to upgrade and maintain than similar systems based on minicomputers.

Photograph by Janice Rubin

strategy is well suited to taking advantage of that shift, Rose says. The major problem isn't technology, but making users and the various companies that resell Digital products aware of its PC integration products and services.

"We've been doing a lot of things in that area over the last 18 months," Rose says. He points to the company's beefed up ad campaigns and plans to educate resellers of Digital products.

But the fact that companies like Coca Cola aren't buying the message may reveal a soft underbelly at Digital. The company's strategy in the PC arena is to integrate existing desktop systems into corporate networks, but some feel this may not be enough.

Where Digital May Be Losing

At the Stamford, Conn.-based market research house Gartner Group Inc., Digital's failure to demonstrate a winning PC strategy is viewed as its major shortcoming. "If there is anything they need to address, anything that will kill them over the long term, it's the desktop," says analyst Steve Wendler.

"There are 35 million PCs out there. The vast majority are not DEC products or even connected to DEC products. That's hurt short-term revenues, but the real problem is strategic—the failure to create a customer base among desktop users," Wendler says.

"They've got to change that, because those desktop users are going to grow up, and they won't grow up with any identification to DEC," he concludes. "There's a whole generation that DEC has been cut off from."

It's not exactly a new story. Digital's problems on the desktop date back to 1982, when it introduced its own line of personal computers and failed to gain a significant piece of the market. But as Digital attempts to become the computer company for the enterprise of the 1990s, there's evidence that this recurring issue could hurt that effort.

Cowen & Co., a Boston-based financial securities firm, has been polling DATAMATION readers on their minicomputer and microcomputer purchasing plans since 1973. The most recent survey, conducted last summer, revealed that 41.1% of the money that the 4,700 respondents planned to spend on new systems in the coming year would go to buy PCs. In contrast, only 36.4% of their dollars were expected to go for minicomputers. That translates into an 11.3% increase in the dollar value of PC shipments over the previous year and a 10.5% decline in the dollar value of minicomputer shipments.

Perhaps more foreboding for Digital is the potential for PC applications to bypass minicomputers altogether, such as in the case at Coca Cola.

Where Digital Is Winning

Digital's Rose paints a different picture. Digital's PC strategy plays well with the company's plans to target new markets, he says. "Over the last 18 to 24 months, we have had tremendous success in penetrating accounts where Digital had relatively little business, particularly accounts that have traditionally been IBM strongholds." The two areas that are most obvious in that are banking and insurance, he adds.

DIGITAL'S ROSE: Digital's PC strategy is well positioned to take advantage of the shift to the client/server model of computing.

Photograph by David Bradley

And Digital can claim some recent wins. In January, Aetna Life Insurance Co. announced its selection of Digital as the systems integrator for the 72 offices in its Employee Benefits Division. Digital will implement and manage the project, which links 30 MicroVAX 3400s to some 1,000 Apple Computer Inc. Macintosh personal computers and to the corporation's IBM host systems.

A spokeswoman for Aetna won't reveal dollar figures, but says that, because of the service contract, Digital receives the lion's share of the total integration dollars.

A system at TWA's Getaway Vacations Inc. in Mt. Kisco, N.Y., is a lot smaller, but depends on a similar integration of Apple, IBM and Digital equipment. The ability to use the desktop device of choice is one of the major advantages, according to president Craig Pavilus.

He has a Macintosh at his office and another at home. Coming from a marketing, rather than a computer background, Pavilus says Macintosh's famed ease of use is just the ticket.

The sales staff uses terminals to access the application, but management uses 15 Macintoshes to oversee the business. "I have on my Mac a . . . display, by product line numbers, of sales and revenue, and it's updated every 30 seconds. What the system really provides is a sales management tool," Pavilus says.

But some experts are wondering aloud whether simply connecting other manufacturers machines is the right desktop strategy. Even if companies like Coca Cola Foods, for example, had gone with Digital for its office automation system, a weak PC offering would likely still be causing fiscal problems for the computer maker, according to the Gartner Group. Analysts at Gartner evaluated All-In-1 Phase II, the latest version of Digital's integrated office automation package. The outcome wasn't favorable for Digital's bottom line.

Unlike previous versions, the new package supports multivendor desktop workstations, including Macs and OS/2 and MS-DOS machines. But, as more of the processing power moves out to those other vendors' desktop devices, so does the revenue, says Cliff Conneighton, Gartner's program director for office information systems.

A 100-user configuration under the old version of All-In-1, using terminals on the desktop, cost $709,000, all of it collected by Digital, Conneighton says. A 100-user configuration using All-In-1 Phase II, with third-party workstations on the desktop, costs $621,000, and Digital gets only 24% of the revenues. If a user gets creative and takes advantage of some free services available for VMS, the cost of All-In-1 Phase II can drop to $532,000, with just 11% going to Digital.

"If you compare [11% of a $532,000 sale] to where they were before, they are down to 8.5% of their original $709,000 sale. All the rest of that money—91.5%—is going to third-party PC makers

Digital could get its feet cut off and bleed at the ankles if it loses the All-In-1 marketplace.

and third-party application providers," Conneighton says. "DEC's biggest revenue/profitability risk in the 1990s is not adding enough of the value in areas that are becoming the dominant component of the system's price—applications software and the desktop hardware."

The New Players

New competition compounds such risks to Digital in the office automation arena, says Joseph Payne, vice president at investment banking firm Alex Brown & Sons Inc. in Baltimore. He suggests that, although Digital is attempting to move into new markets, there is a danger of losing ground in areas where the company has been traditionally strong.

For example, All-In-1 controlled as much as 40% of the office automation market in the late 1980s, Payne says, but that was before last year's release of IBM's OfficeVision product. "IBM is looking at the All-In-1 marketplace as a major battleground for 1990," he says.

IBM won the hearts and minds of users when it pumped enough money into Intel Corp. to keep development of the i486 32-bit chip afloat, Payne says. "And now they are buying the hearts and minds of the applications cogenerators with minority investments to write for the i486 standard.

"Digital stands to possibly lose major share against IBM," Payne adds. "That's the Achilles' heel. That's not an inappropriate pun because they could get their feet cut off and bleed at the ankles if they lose the All-In-1 marketplace."

Are PCs Toys?

One former Digital employee, requesting anonymity, suggests that founder and president Kenneth H. Olsen simply doesn't consider PCs real computers. "I really don't think he understands modern computing," the employee says. "I don't think he understands what people use computers for today, and that's why he's missed the PC. He really does still think they are toys."

And Olsen's own comments offer some evidence that he takes PC-based applications less than seriously. "One reason computers have not helped productivity is that they encourage people to make endless numbers of slides . . . devoid of meaning and content," Olsen told a recent gathering at a conference on client/server computing sponsored by the Cambridge, Mass., research firm Forrester Research Inc.

"The spreadsheet may go down as the worst thing to ever happen to U.S. industry, because its users lose sight of their own businesses," he added. Of course, Olsen might be right. According to Gartner Group's research, white-collar productivity in 1987 was exactly at the same level it was in 1967. And that was after huge investments in PCs and integrated office systems.

Digital is banking on a strategy that says the greatest value it can bring to the PC arena is connectivity, leaving other vendors to build the boxes. That policy could be smart business. As the cost of personal computers drops and competition heats up, profit margins per box will be small indeed. Digital may be better off staying out of what is essentially becoming a commodity market.

Digital's PC integration business doubled between 1988 and 1989, reaching $400 million in revenues for fiscal year 1989, which ended last June. The figure is expected to double again in the current fiscal year. That success has translated into additional attention and resources from Digital's senior management directed at the Personal Computer Resource Group, Rose says.

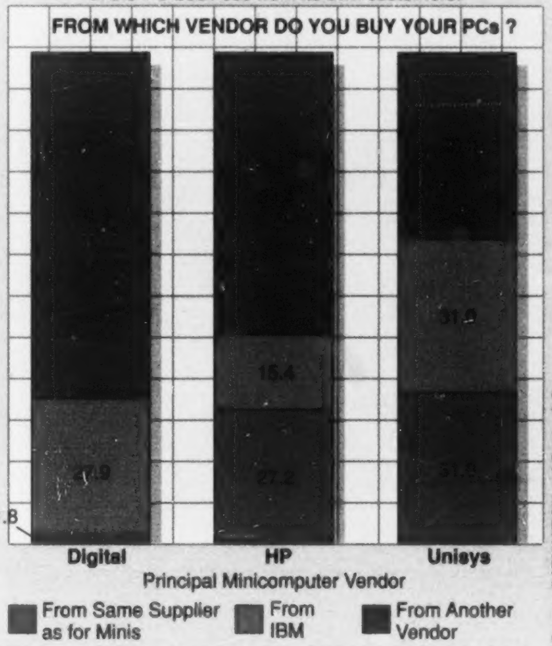
Digital's minicomputer heritage may, however, still be distorting its outlook. Olsen has often said that large classes of users—secretaries and factory workers, for example—will never want more than a terminal on the desktop. But Coca Cola's Currid disagrees and, if she's right, Digital's PC strategy is going to mean missed opportunities.

the cl "In a LAN environment, you put the processing power on the desktop, and it's amazing what people will rise to in terms of their use, even secretaries," she says.

For example, secretaries using PCs are able to juggle the workload from more executives than they could with either a terminal or a single-tasking computer, Currid says. "It's those kinds of things that maybe aren't intuitively obvious to mini and mainframe people." ▭

Missing the PC Market

Digital hasn't been able to gain more than a toehold in the PC market, even in its own customer base. Rival IBM captures 57.2% of the PC business from its own customers.



Source: DATAMATION and Cowen & Co.

New Allies: IS and Service Suppliers

Outsourcing and on-line databases are being embraced by IS executives as a means of improving efficiency. But are there reasons beyond cost and scarce IS talent for relying on outside IS service suppliers? You bet!

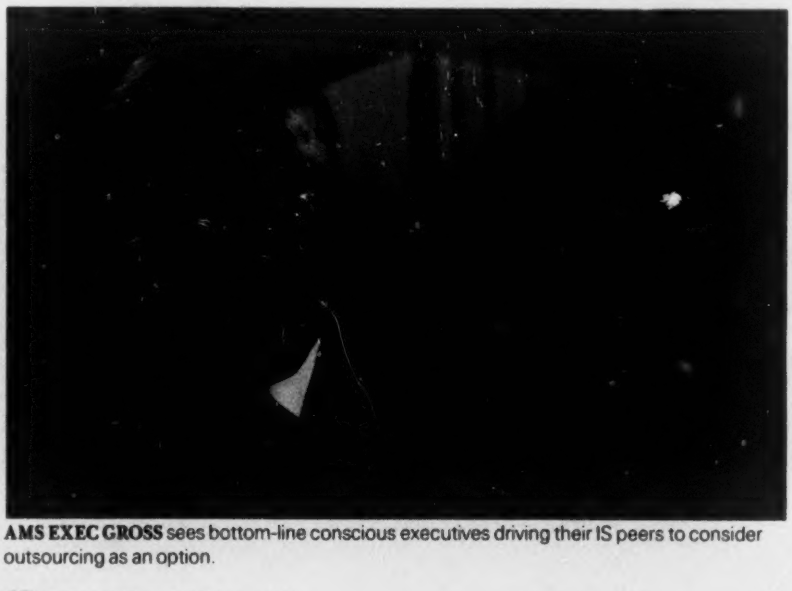
BY JOHN McMULLEN

The 1990s promises to be an era of efficiency, if nothing else. All organizations, public or private, will strive to make decisions, create products and deliver services faster, cheaper and better. The pressure to achieve those objectives will be felt strongly by managers of information technology, whose systems will carry out the ends needed by corporations, agencies and institutions of all kinds.

Information systems executives are responding to such pressure in a variety of ways, as we've seen in previous reports in Systems and Strategies, a continuing series in DATAMATION this year. They are focusing more intently on applications. They are building electronic hierarchies to organize their companies. They are distributing their computer power out to where it can be best applied via networked client/server systems. Perhaps the most innovative and profound way, however, is to make their own IS organizations more efficient by increasing their reliance on outside IS service providers—both for professional needs such as programming and for information needs such as databases.

Managing these IS resources, external as they may be, will become an important task for top IS professionals in this decade. To take advantage of such resources, chief information officers, network managers—virtually everybody in IS organizations—must:

- **Understand when going outside helps.** If IS managers are under pressure to reduce costs, or if they face critical IS talent shortages, they probably should be seeking help from service suppliers.
- **Examine where IS employees are spending their time.** If they are relying more on outside service suppliers, they probably should be spending fewer hours at internal staff meetings and more hours visiting and conferring with the professional and information services providers.
- **Focus their internal IS resources on critical projects.** IS employees can feel threatened when their departments decide to outsource. Managers can minimize bad feelings by maximizing employees' participation in projects criti-



Photograph by Dennis Brack

AMS EXEC GROSS sees bottom-line conscious executives driving their IS peers to consider outsourcing as an option.

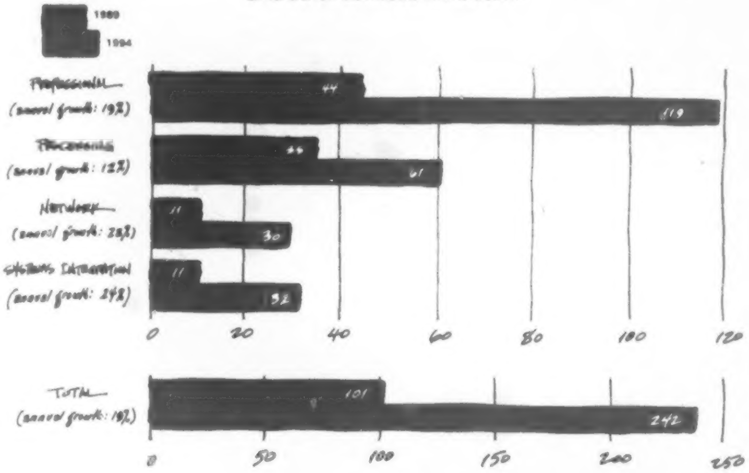
When we had our own systems programming staff, they were always fighting with the users for resources.

cal to the way their organization will compute in the 1990s, such as local area networking implementation.

- Measure, maintain and improve IS quality and responsiveness. If IS departments want to continue to serve the information needs of their customers—i.e., end users—they should ensure that the services rendered end users do not suffer when the services are shifted to outside suppliers. Issues such as interfaces, quality of data and support are critical.

The Outsourcing Services Explosion

As users outsource more of their IS operations, the demand for professional and other services will boom.



Source Input

The trend among medium and large user organizations to depend more on outside IS services is unmistakable and, to a degree, unavoidable.

Users worldwide are expected to more than double their already hefty spending on professional IS services by middecade from $101 billion in 1989 to $242 billion in 1994, according to Input Inc., a market research firm in Mountain View, Calif. The firm's definition of such services—which are increasingly coming under the umbrella term of "outsourcing"—covers processing services, network services, turnkey systems, systems integration and other functions.

The need for outside information services stands to grow from $19.7 billion in 1988 to $32.5 billion in 1993, estimates Veronis, Suhler & Associates Inc. The New York City investment banking firm categorizes information services into marketing, economic/financial, credit, payroll/human resource, product/price, legal/regulatory, scientific/technical and general business data.

What's causing such demand is hardly a secret. Affecting IS operations are the same forces shaping every other business decision in this last mile before the new millennium. Global competition, shareholder pressure and human skills shortages, among other forces, are leading the '90s corporation to seek out expertise of all types. If a commercial systems integrator can tie corporate systems together better than an in-house systems integration staff, so be it. Outsource! If a database vendor can collect more accurate marketing information on a corporation's products, so be it. Access!

The Ins of Outsourcing

What really lies behind and beyond such calls for IS action? Here are the lessons of a few users that have chosen to rely more on outside professionals to do their computing, as well as the thoughts of some leading experts as to what's causing them to behave this way. Later on, you'll find out why users are building conduits of information into their organizations from outside reservoirs of marketing and other vital data.

Outsourcing, a term that came into vogue in IS circles in the late 1980s, is general by definition but specific by application. It describes a variety of services, everything from outright facilities management to contract programming, from network management to systems integration. But it also must be applied on a case-by-case basis—that is, it's not for everybody.

In fact, DATAMATION's own 1989/1990 IS budget survey, which will be detailed in our April 1, 1990 issue, reveals that the average IS executive this year is budgeting only 12.6% of resources for outside IS services.

There is mounting anecdotal evidence, however, showing that users in the '90s will be moving specific pieces of the IS function outside. Some see a chance to free up IS resources from central, headquarters-type functions to distributed line applications. Dial Corp., for example, six weeks ago announced its decision to outsource most of its mainframe processing to Andersen Consulting. The Phoenix-based company, a subsidiary of Greyhound Corp., gave Andersen the big iron tasks in order to concentrate its IS resources on building a distributed network of midrange systems to support its personal-care and household-goods operations.

David McKay expects to see a lot of companies take this approach in the 1990s. The director of resource operations at Lexington, Mass., consulting firm Nolan, Norton & Co. says, "The way technology will be used will be different in the future. Instead of functional organizations, companies will be more oriented around their business units."

Patrick Gross, vice chairman of American Management Systems Inc., confirms this trend among his systems integration customers. "Bottom-line senior executives who are more knowledgeable and more involved in business objectives are driving the outside services trend," says Gross, whose Arlington, Va., company has grown to $213 million as a result. "They are thinking, 'I will trade total control [of a specific project] for greater impact on my business.' "

The Programming Payoff

One user organization that's already seen the impact of outsourcing on its performance is Great American Bank SSB of San Diego. Six or seven years ago, the bank's programming staff was struggling to meet the demands of its end users. So it shifted responsibility for programming to an outside firm, which went out of its way to seek input from Great American's end users to establish programming priorities.

Great American replaced all of its internally developed software with commercially available banking packages from Systematics Inc. of Little Rock, Ark. The bank's contract with Systematics calls for the firm to install, customize and maintain those applications. As a result, Great American has been able to reduce its programming staff from 85 to 51. "We just could not afford to develop our own applications," explains Tom Lester, first vice president and manager of Great American's IS division in San Diego. "When we had our own systems programming staff, they were always fighting with the users for staff resources. Now those choices and decisions are made by the users themselves."

Another San Diego user organization, Foodmaker Inc., has pursued outsourcing not so much to redistribute resources as to reduce costs. Consequently it

An Information Provider's View

Few suppliers of IS services stand to benefit more from the growing corporate appetite for competitive information than Dun & Bradstreet Corp. The New York City-based information services company has grown to $4.3 billion by feeding information to the corporate world.

Robert Weissman, president and chief operating officer of D&B, shares some of his thoughts about the future of the information services business with us.

Q: What's driving demand for information services?
A: The *Fortune* 500 companies are likely to be much more intensive [users of information services] in response to uncertainty in the rate of change they are experiencing. We're seeing rapid change being brought about in so many markets as a result of new technology infusion, breakdown of geopolitical barriers and globalization of markets. All those things tend to create instabilities, uncertainties and risks. And as human beings, we want to be able to manage that uncertainty and those risks. One of the prime devices we have is to better understand that environment, and that means information.

Q: How much are technologies such as compact disc read only memory (CD-ROM) and networking fueling the explosion in user requirements for more information?
A: It's a process between the technology and the customers, who are reacting to technology change at a greater rate than ever before. Ten or 15 years ago, the technology was totally alien to the main body of end users. The phenomenon of the personal computer has done more to change that perhaps than anything else. . . . He [the end user] is an order of magnitude or two more sophisticated about technology than he was. The end user is in a position to recognize much more clearly what technology ought to be able to do. His expectations are rising. He is likely to have a lot of computer power on his desk, and he has a greater degree of control.

There is more computer power on the desk of a *Fortune* 500 company than there is in the IS department of that company . . . by a lot. They [end users] are saying we want to be able to get the information response that we need flexibly, quickly and transparently. This is driving to the same sort of de-massification that's taking place in other businesses.

D&B'S WEISSMAN says users need more info.

Q: What will drive the integration of internal and external information—better applications or filtering mechanisms?
A: To a great degree, it is applications. There are still today technology barriers to be broken down. [In collecting point-of-sale information, for example,] we are collecting it more and more intensively each day. The last time we checked, that [POS] database was at 4 terabytes and growing rapidly.

You can say that computing power comes fast and cheap and can do a lot more, but 10 years ago a big database was 50 million bytes. Now when you talk about a database, it might be 50 terabytes, so you still have a major challenge [in creating information from data]. You have software issues, and issues about efficiently deciding where in a network environment that data are going to reside and [where] the processing ought to be done. Even though we may have moved from a 300-baud world to T1 lines, when you start talking about the quantity of data being collected, communications issues have not disappeared.

Q: Given such huge amounts of information being collected and stored, the potential for information overload seems greater than ever. Do you agree?
A: Your term, filtering mechanisms, continues to be very important for that very reason. Perhaps the greatest danger I think the typical company has is that there's that human tendency to define information needs—information systems needs—in the context of the data that are easiest available. That's contrasted to data that are needed to make a better decision or come to a better understanding.

In IS, that's an ongoing tendency and one that can lead to disastrous results. They measure what is easily measurable, but guess what? What gets measured becomes very important.

If you're an IS director, the real challenge is to be an information engineer who understands the end user's information needs well enough to really get a grip on what is relevant to his needs in terms of hardware, software, communications and data and how that ought to be packaged or engineered.

Outsourcing, a term that came into vogue in the late 1980s, is general by definition but specific by application.

has pursued a slightly different IS outsourcing path: taking the processing route rather than the programming road. The fast-food chain operator is buying raw computing power from Litton Computer Services—a choice it made some five years ago. At the time, recalls Foodmaker IS vice president Terry Babbitt, the company was in the midst of a leveraged buyout, limiting what the company could spend on internal IS operations. Nevertheless, it also had grown so fast that it needed to develop its own data center.

Foodmaker opted to farm out its mainframe operations to Mountain View, Calif.-based Litton. "It required no capital investment and was cost effective," Babbitt says, revealing that IS costs are down 15% as a result. The deal also entailed little risk that Foodmaker would lose control over its IS destiny. To this day, it has complete freedom to manipulate its own data—even though they reside on Litton's machines.

The outsourcing deal has another big benefit. Foodmaker can spend its IS dollars elsewhere. For example, it's currently installing 386-based PCs in the back offices of each of its 600 company-owned Jack-in-the-Box restaurants. The PCs feed data to Foodmaker's own minicomputers, which in turn send information to Litton's mainframes.

Like Great American and Foodmaker, most user organizations that rely on IS outsourcing do not relinquish all of their IS operations to suppliers. To do so, say some executives, is a big risk—one that's difficult to justify taking up front. Not even Eastman Kodak Co., the most notable example of a corporation that's decided to outsource much of its IS operations, has handed over all of its IS tasks to its chief outsourcing suppliers, IBM and Digital Equipment Corp. IBM will run Kodak's data center operations, while IBM and Digital share management of its network. Kodak is going to focus its IS energies on building distributed applications within its business units.

The Right Approach to Outsourcing

But visible moves, like the film giant's, put increased pressure on other corporations to explore the option of outsourcing—if not everything, then at least pieces of their IS operations. "Primarily, financial pressures are forcing them [publicly held companies like Kodak] to focus on what they do well," says Edward Choate, a consultant for Arthur D. Little Inc. in Cambridge, Mass. "In light of that, companies are taking a look at each function of IS before deciding to outsource piecemeal."

For TRW Inc. the piece of the IS picture that's going to be left out will be mainframes. TRW has set its sights on moving away from host-based computing on mainframe systems to a client/server model that uses IBM PS/2s and Apple Macintoshes as workstations and Digital MicroVAXs as servers. "Obviously [our] well-trained technical people see the end of their career ladder as we phase out mainframes," says Bill Nelson, director of technology management for TRW's Corporate Information Resources. During the phasing out of those systems, TRW will need outside sources of maintenance support if its mainframe technical talent flees or needs to work on other types of systems at TRW.

In TRW's new vision, end users will become much more self-sufficient. "Our thrust is to try to change the information technology such that the end user has control of his own destiny and is really proactive in the development of his [own] applications," Nelson explains. At some point, he adds, mainframe applications that cannot migrate to PCs are likely to be outsourced to third parties. Currently, the Cleveland-based company's automotive and corporate divisions, under strict orders to hold down employee headcounts, are going outside for contract programming on special projects. About 10% of the IS work load in those divisions is now performed by outsiders.

FORD'S LINDER buys data from Japan, Europe and the U.S. He measures the data's value by how much end users use them.

Photograph by John Hillery

Not all of those who are outsourcing are entirely enthusiastic. Right now, for example, Gillette Co. believes most IS functions are best kept inside the razor kingdom. "The real issue [for Gillette] comes down to whether we can do it better in house," says Ted Standish, director of information resources for Gillette's North Atlantic Shaving & Personal Care Group in Boston. That's where the company's main data-processing center is located. Nevertheless, Gillette does intend to make greater use of IS outsourcing services, notably contract programming and facilities management in the United States and Europe. Most of its outsourcing will occur from its smaller remote sites, where there may not be enough work to keep in-house staff occupied.

However, for the most part Gillette is comfortable handling those IS chores on its own. "We're where we want to be," Standish says, explaining that maintenance will always be an issue in deciding whether to go outside for things like contract programming.

"We have an application that's very important to our operation that was written several years ago," he says, by way of an example. "The software it was written with no longer exists, so we have to hunt up the last known guy familiar with the application when things go wrong." Standish adds that Gillette now buys a lot of applications packages off the shelf instead of starting from scratch. "We develop applications from scratch only for things that are unique to our business or to our company."

SCWHAB'S BARMANN sees demand to combine internal and external data.

Photograph by Robert Foothorap

Another user, Fleet/Norstar Financial Group Inc., a superregional bank headquartered in Providence, R.I., seems to be hesitantly testing the outsourcing waters. The banking group's use of outsiders is limited to things like processing credit card applications, although it may expand to trust processing.

"Obviously, we must be given assurances that we will have [some] control of level of service," says Michael Zucchini, Fleet/Norstar chief information officer. He doesn't expect outsourcing to be a new wave at Norstar because as he puts it, "We believe we can do it as well as anyone else. Our data processors are good business people."

The one-IS-step-at-a-time approach to IS outsourcing may, however, give way to an all out rush. "Systems management is the business of the 1990s," asserts John Oltman, a managing partner with Andersen Consulting's worldwide integration services. The firm's view of systems management extends beyond facilities management, a term that simply describes the maintenance of computer processing and networks, to include software renewal and enhancement.

"We think the best answer [may be] joint ventures for delivering IT solutions," Oltman says. User organizations and integrators such as Andersen Consulting are likely to be entering arrangements in which both share the risks and the rewards of codeveloping systems. The shared approach will most likely be pursued in cases where user organizations are radically changing their approaches to particular areas of business.

When Sharing Makes Sense

Shared development may be the most effective way to win favorable judgment, believes Barry Sullivan, director of corporate marketing for Electronic Data Systems Corp. of Dallas. "Large from-the-ground-up systems development exercises are going to be rarer and rarer," he predicts. Instead, he sees users and integrators collaborating to build systems out of customizable components.

Sharing is very much part of the IS culture at Royal Bank of Canada. The Montreal-based bank, Canada's largest, is working with a software applications developer to create a program that would allow the bank's end users to extract information via PCs from any centrally located or remote database. The application itself belongs to the developer, which the bank says it can't identify yet for contractual reasons. Part of that contract calls for the developer to maintain the application for the bank; another part allows the developer to sell the program to other user organizations.

Royal Bank's return on the shared project is considerable. Beyond the cost savings realized by sharing development expenses, the bank requires far fewer IS staffers (if any) to maintain the program. "The long-term benefit is [that] over 70% of my staff is now freed up to develop new technology and new applications," says James Grant, executive vice president of systems and technology of Royal Bank.

Technology itself will play a key role in accelerating the trend toward outsourcing IS services. Advances in networking, for example, allow organizations to outsource more processing without disruption to end users. Furthermore, the specialized knowledge required to take advantage of technology will lead organizations to search for the best economic terms for obtaining such knowledge—a search that frequently leads them outside.

The danger, of course, is loss of control, but the reward, flexibility, may be worth it. "If the technology issues are really highly strategic to you, you have to be careful," cautions Nolan, Norton's McKay. "You could give up a level [degree] of flexibility by using an outside vendor. It's one of the big tradeoffs."

The Competitive Value of Information

Although many IS organizations have had no direct experience with outsourcing professional aspects of their IS operations, few have escaped the need to look outside for information critical to their companies. More than 4,000 commercial databases already exist to provide such information—a number expected to grow during this decade as access to reliable information becomes an increasingly important competitive tool.

"We see a gradual trend to expanding the external supply of information relied on by corporate IS," says Arthur D. Little's Choate. "The information is being used for strategic and planning areas and not as it once was for operations and control." Two things that will enable IS executives to deliver such information, he adds, are better filtering applications and expert systems. The former will create manageable amounts of information; the latter will link together abstract relationships among data.

A challenge for IS executives, then, is to merge outside information with inside information to create a database of knowledge from which managers can draw to make decisions they otherwise could not make.

External database information can be grouped into any of a half dozen or so overlapping categories. Those include analytical economic and financial information; business information (for credit risk models, financial analysis, strategic planning, mergers and acquisitions and cash flow management); legal and regulatory information; medical, scientific and technical resources; marketing information (analytical data for competitive analysis); and business industry news (such as the Dow Jones News/Retrieval service).

Hands down, marketing research constitutes the most popular and sought after data. Veronis, Suhler & Associates predicts that corporations will continue to spend twice as much for marketing information as they do for the next single biggest category, economic and financial data. The investment banking firm estimates that companies bought nearly $7 billion worth of marketing data in 1988—representing 35% of total corporate outlays for information services that year. Spending for economic and financial data accounted for almost 18%, or $3.5 billion, of the $19.7 billion allocated to such services in 1988. The total market in 1993 is predicted to reach $32.5 billion.

Fueling the sort of growth expected by Veronis, Suhler are structural changes taking place in user organizations. Kodak, which is striving to become as decentralized as possible, again provides an excellent example. "Historically, we looked inside for information in planning for the future," says Roy Holmes, associate director of corporate IS at Kodak. Holmes estimates that as much as 90% of such information used to come from inside the Rochester, N.Y., company's various divisions.

"As the business units get up to speed, they will find more and more need for information about products and competitors. The bulk of that will come from external sources," Holmes predicts. Within 10 years, he says, Kodak could be obtaining 90% of its information outside. For the moment, its use of external database information is limited mostly to Mead Data Central's Lexis (legal) and Nexis (news and business) services.

The Cost of Information

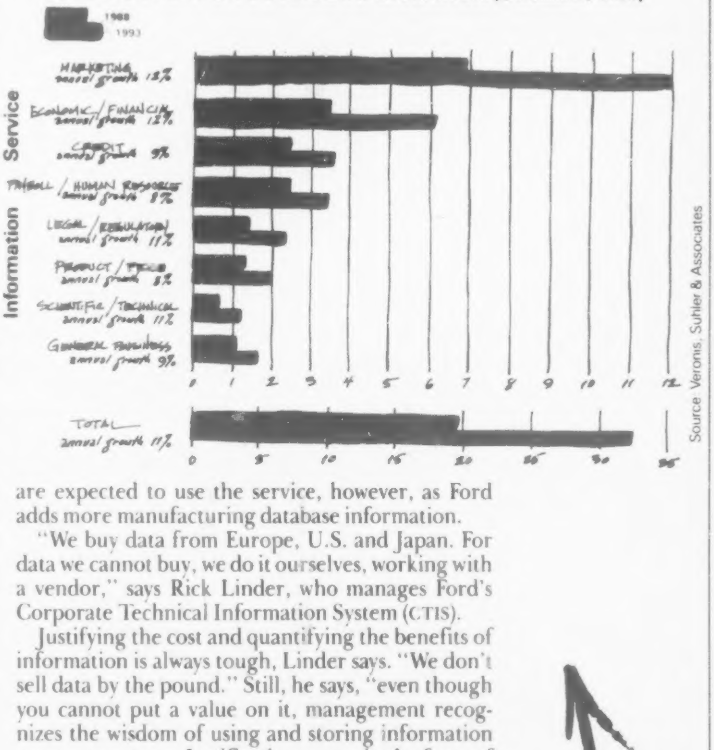
For other users, the cost of information is nearly as important as the quality and timeliness of it. "At what price can the [external] information be obtained is always an issue," says Mark Barmann, executive vice president and chief information officer of Charles Schwab & Co. Inc. of San Francisco. "The economics of obtaining the data are not always easy to see."

The extent of Schwab's use of external data may come into sharper focus as the firm implements its new distributed-computing plan for the '90s. Schwab plans to disperse real-time information over an enterprisewide network. The plan, dubbed Schwab's Architecture & Migration Strategy, will move the firm away from a single-node, classical mainframe hierarchy.

Like Kodak, Ford Motor Co. is another example of a nonfinancial corporation with a huge investment in and commitment to both external information services and internal data. Ford combines external data with its own information to offer an on-line information service. The service comprises 24 separate databases for some 4,000 of the company's end users. Most users today are Ford product engineers and product planners; fewer than 20% come from the manufacturing ranks. More factory end users are expected to use the service, however, as Ford adds more manufacturing database information.

The Unsatiable Information Appetite

As competition grows more fierce in business, end users will demand more information from the outside world.


DOLLARS SPENT ON OUTSIDE INFORMATION ($ Billions, U.S.)

Source: Veronis, Suhler & Associates

"We buy data from Europe, U.S. and Japan. For data we cannot buy, we do it ourselves, working with a vendor," says Rick Linder, who manages Ford's Corporate Technical Information System (CTIS).

Justifying the cost and quantifying the benefits of information is always tough, Linder says. "We don't sell data by the pound." Still, he says, "even though you cannot put a value on it, management recognizes the wisdom of using and storing information everyone can use. Justification comes in the form of the time users say CTIS saves them."

The databases contain gigabytes of information on the automotive industry, including news files, technical files, vehicle specifications. The bulk of the external data is acquired from the Society of Manufacturing Engineers (SME) and the Society of Automotive Engineers (SAE). Linder maintains, however, that one of the major benefits of CTIS, which went on line some four and one-half years ago, is to avoid overloading workers with information.

But, he cautions, "it's like walking into a big library. You have to know what you're after, organize your search strategy and then execute the search. Having the data on a mainframe requires the same thought process. Benefits include the ability to do a search and [having] a library that's as close as the keyboard on your desktop machine." ▭

EDI Aims High for Global Growth

Suppliers and users of electronic data interchange (EDI) services have a vested interest in supporting the boom in international trade. But conflicting standards may slow worldwide growth over the next few years.

BY CHERYL D. SNAPP

Global commerce is nothing new. But as trade sanctions are lifted and joint international ventures become commonplace, trade is becoming increasingly fast paced and intense. As global competition swells, companies are turning to technologies such as electronic data interchange (EDI), which facilitates computer-to-computer communication of standardized electronic transactions between sites.

Liz Claiborne Inc., one of the nation's leading clothes manufacturers, uses international EDI to coordinate activities between U.S. corporate offices in New York City, its headquarters in New Jersey and the company's six Far East operating sites. Likewise, Ford Motor Co., based in Dearborn, Mich., uses EDI to correlate inventory requests with suppliers in Europe.

The wisdom of EDI is obvious. Transactions that have traditionally involved mailing or faxing paper documents—order forms, invoices and fund transfers—can be handled more efficiently through company-owned or public electronic data network services.

"We consider EDI an absolute necessity," says Tom Bass, manager of production, planning and control for Ford. "Just by eliminating the mail time alone, we're able to dramatically improve our rate of inventory return."

When dealerships order cars, Ford breaks down the transactions into thousands of purchasing requests matched against blanket purchase orders for each of the suppliers involved. Before EDI, these requests were delivered to the suppliers by mail. Today they are transferred in electronic format to the suppliers' computers. The order process that used to require at least a week is now completed within a matter of hours.

EDI also improves accuracy. According to Bass, "in an EDI system, the data is input once, by the person who knows best what the information is, rather than reentered as it proceeds through the system." In the case of Ford, employees enter information into the EDI system immediately as orders for cars are received. The information moves directly into the suppliers' computers as requests for parts, and Ford eliminates the possibility that order entry clerks at major vendors will misplace or misread the request.

Most existing EDI systems have been implemented by in-house groups for companies in the automotive, retailing, chemical and electronics industries. Challenges arise when those companies seek to extend their EDI programs to encompass transactions with trading partners on a broad national or international scale.

A November 1988 report by Datapro Research of Delran, N.J., notes a trend among companies such as K mart Corp. and General Motors Corp. These large buyers are issuing requests to their external suppliers to communicate with them via EDI. "While these requests may or may not take the form of ultimatums," the report states, "the message is still the same—if we process [many] of your orders per month, we'd prefer to deal electronically, and the sooner the better."

As suppliers face the challenge of communicating with multiple organizations, they're increasingly forced to rely upon third-party value-added network (VAN) carriers to provide them with access to EDI. VAN suppliers such as El Segundo, Calif.-based Infonet Computer Sciences Corp., Tymnet and Telenet Communica-

FORD'S BASS: Orders that once took a week to process on paper can now be filled in a matter of hours with EDI.

Photograph by John Hillery

tions Corp. of Reston, Va., can take responsibility for providing the data carrier service. They can also reformat data messages to the specific requirements of various groups.

Although forms such as purchase requests generally include the same types of information worldwide, a document format considered standard by U.S. companies may not be recognizable in, perhaps, Switzerland. As a part of their service, local VAN carriers can reconfigure the U.S. purchase request into the format the Swiss suppliers require.

VAN carriers are growing in popularity. New York City-based research firm Link Resources Corp. reports that revenues for domestic VANs increased approximately 10% per year between 1987 and 1990. International VAN carriers, or IVANs, are growing even faster, but total IVAN revenues are much smaller than the U.S. counterpart.

International Challenges

Significantly, neither Datapro nor Link Resources expects global EDI to gain widespread prevalence over the next several years. Considering the high level of current interest in international trade, why is global EDI taking so long to evolve?

Global EDI faces five primary hurdles:

1. Cultural differences. In order to succeed, global EDI must deal with the same challenges that face every aspect of international trade—time differences, dissimilar customs and business styles, language barriers, tariff structures and incompatible document formats.

2. Legal Implications. Who is responsible if only part of a document is transferred or if the data arrive at the wrong destination? If a document is intercepted by an unauthorized party, who is liable? Such legal implications inhibit national EDI and pose an even greater challenge on an international scale.

3. International Support. To succeed, global EDI must ensure qualified training and support mechanisms at every networked locale.

☐ **U.S. AND EUROPEAN STANDARDS FOR THE AUTO INDUSTRY ARE INCOMPATIBLE.**

4. Conflicting Standards. Unfortunately, EDI has evolved differently among various industries and even among the same industries in different regions. "EDI suppliers are forced to deal with unlike implementations among industries and in different parts of the world," says Laura Andrus, director of marketing for Infonet. "For example, there are U.S. and European standards for the automotive industry, and the two are completely incompatible."

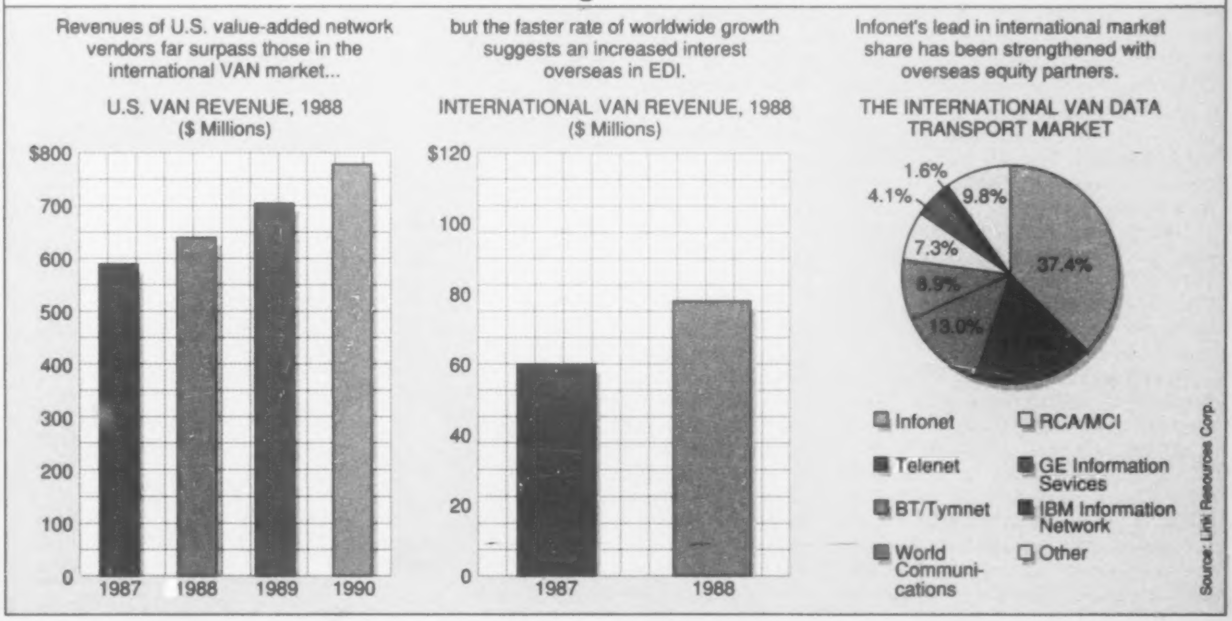
Current de facto EDI standards include the American National Standards Institute (ANSI) X.12, which prevails in Canada and the United States, and EDIFACT (EDI for Administration, Commerce and Transport), which appears to be emerging as the international standard.

5. Complexities of Distance. When suppliers are scattered throughout the world, it's difficult for the various parties to negotiate and reach agreement on consistent EDI network implementations. For example, even if the parties agree that the third line of the purchase request is reserved for the supplier's address, they can run into trouble if the U.S. document allows the entry of 15 characters on line three, but the Swiss format accepts only nine characters.

EDI vendors are working to address global concerns. In most cases, EDI suppliers offer worldwide service by establishing remarketing relationships with regional VANs. In this way, a supplier such as Infonet can carry a message from a U.S. company to the border of Singapore for remarketing by a local VAN. According to David Taylor, vice president at Gartner Group Inc. of Stamford, Conn., this is the type of global solution that GE Information Services of Rockville, Md., and IBM currently supply.

The multiple carrier approach to international EDI takes advantage of local vendors' abilities to deal with their own regional translations, tariffs, regulations and cultural norms. The negative aspect, however, is that the IVAN carrier loses

Who's Driving the VAN Market


Revenues of U.S. value-added network vendors far surpass those in the international VAN market...

but the faster rate of worldwide growth suggests an increased interest overseas in EDI.

Infonet's lead in international market share has been strengthened with overseas equity partners.

Source: Link Resources Corp.

In Search of Standards

One of the greatest challenges facing proponents of global EDI is the presence of multiple EDI standards. Unfortunately, EDI standards have evolved both by industry and by region, which makes the implementation of a global EDI framework extremely complex.

One of the first EDI standards to emerge was from the Transportation Data Coordinating Committee (TDCC), now called the Electronic Data Interchange-Association (EDI-A). The TDCC standard was designed specifically for the transportation industry, although it has served as the platform for development in other areas. The grocery industry, for example, initiated the Uniform Communication Standard (UCS) about eight years ago as an offshoot of TDCC.

As EDI matures, proponents recognize the need for EDI standards to accommodate multiple industries. The most prominent EDI standard in Canada and the United States is currently ANSI X.12, from the American National Standards Institute's X.12 subcommittee. This standard employs much of the same architecture as TDCC, but is better equipped to traverse industry-specific boundaries.

In Europe, the reigning standard is the United Nations-sponsored EDIFACT, from the EDI for Administration, Commerce and Transport (EDIFACT) committee. Although the EDIFACT standard is less mature than ANSI X.12, (EDIFACT has formally approved only one transaction set; ANSI X.12 has 30), EDIFACT's strength as a de facto standard is too great to ignore.

Although EDI proponents acknowledge that ANSI X.12 and EDIFACT are the leading standards, it is unlikely that the two will converge. For the near future, global EDI solutions will continue to require multistandard support.

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control of the EDI data as the messages are handed off, and it becomes more difficult to ensure uniform service and support.

A Class by Itself

According to the Datapro report, IBM's Information Network falls into a class by itself, in some respects. Because of Big Blue's large base of installed systems, it is relatively easy to send EDI documents from one IBM site to another. IBM's preferred EDI standard is, not surprisingly, the company's own Systems Network Architecture/Synchronous Data Link Control (SNA/SDLC) protocol environment. According to the report, "IBM's primary advantage is its marketing clout . . . . buyers seeking to persuade suppliers to go EDI can count on IBM to go to bat for them and use its polished 'marketing skills' to get them on line."

Although the SNA protocol remains an atypical global EDI network approach, to IBM's credit there are an estimated 30,000 SNA networks already in place. But the SNA standard is primarily useful only for intracompany transmissions. As IBM shops automate communications with their suppliers, they face the same EDI challenges as everyone else. Unless their suppliers are also standardized on SNA, some type of EDI conversion is still required.

In December 1988, Infonet announced a new approach to global EDI: the company formed operating alliances with a number of the national Post, Telephone and Telegraph agencies in other countries. Under the agreements, the PTTs own portions of Infonet stock. Ten PTT partners currently control 70% of Infonet stock; U.S.-based Computer Sciences owns the remaining 30%. The program, called Global Trading Partner Management, is designed to ensure that trading partners have a vested interest in advancing Infonet's global EDI.

> ☐ **REMOVAL OF TRADE BARRIERS IN EUROPE WILL LIKELY CAUSE AN EXPLOSION IN EDI.**

Global Software

Infonet provides EDI software developed by Supply Tech Inc. of Southfield, Mich., on an original equipment manufacturer (OEM) basis to all of the global EDI participants. This software provides end users with transparent EDI translation services within the framework of a consistent user interface.

"We're just now starting to implement global EDI," says Ted Annis, president of Supply Tech. "This is coming about as a result of our U.S. clients needing to establish EDI relationships with suppliers in Europe and the Asian Basin. Although international EDI implementations are now in the beginning stages compared with those being established in the United States, Annis expects them to gain in strength.

The Gartner Group's Taylor views the Infonet approach to global EDI as a positive trend. "The advantage to Infonet is that they wind up being a low-cost, long-haul service provider for data services," he says.

The potentially negative aspect Taylor foresees is that the majority of the PTTs are government-operated and/or government-regulated utilities. "The PTTs' ability to be aggressive marketers of EDI is rather limited," Taylor says. "Infonet's challenge lies in getting the PTTs to be effective agents for EDI in each of those countries."

Says Mark Winther, vice president of electronic communication services for Link Resources, "I think Infonet's strategy to be a multinational EDI gateway is sound." But he also cautions that "their success will depend heavily on the types of partners they've got. They're still just beginning to build these relationships."

EDI growth in Europe may be spurred by U.S.-based multinational corporations extending their EDI networks overseas. Supply Tech's Annis reports that among nonautomotive manufacturing firms, Peoria, Ill.-based Caterpillar Inc. is currently the largest EDI site in the world. Caterpillar uses the ANSI X.12 EDI standard to exchange a total of five types of electronic documents with an estimated 800 suppliers worldwide. "Up until three months ago, we weren't even allowed to talk about Caterpillar's EDI program, because the company regarded it as a strategic competitive weapon," says Annis.

Supporting a Standard

The Dow Chemical Co. also uses the ANSI X.12 standard. Senior project manager Keith Mead says the Midland, Mich.-based company uses the standard to handle transactions with customers and suppliers throughout North America. As Infonet's EDI program adds support for the EDIFACT standard, Dow Chemical's intent is to extend its EDI program to encompass company transactions worldwide.

Ford, which also uses EDI extensively on a national basis, is now in the beginning stages of establishing its EDI program worldwide, says production manager Bass. "Internationally, EDI's at about the same point as it was over here [in the U.S.] a couple of years ago," says Bass. "They're not as convinced in Europe, for example, that EDI is all that wonderful, and that it's the way to go. It's taking some selling."

Still, there's no hesitation in the current advice to clients from Winther of Link Resources: "It's time to pick an EDI standard and just do it. The benefits are clear."

Cheryl Snapp is a freelance writer specializing in communications for Orem, Utah-based Snapp & Associates Inc.

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SPECIAL REPORT: IS BUDGETS IN RECOVERY!

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SYSTEMS & STRATEGIES FOR THE '90S:

The New Agenda for OPEN SYSTEMS

Users Say UNIX Isn't Enough
Now They Want Standards at Every IS Level

Also in This Issue:
X-Terminals: The Latest Desktop Contender
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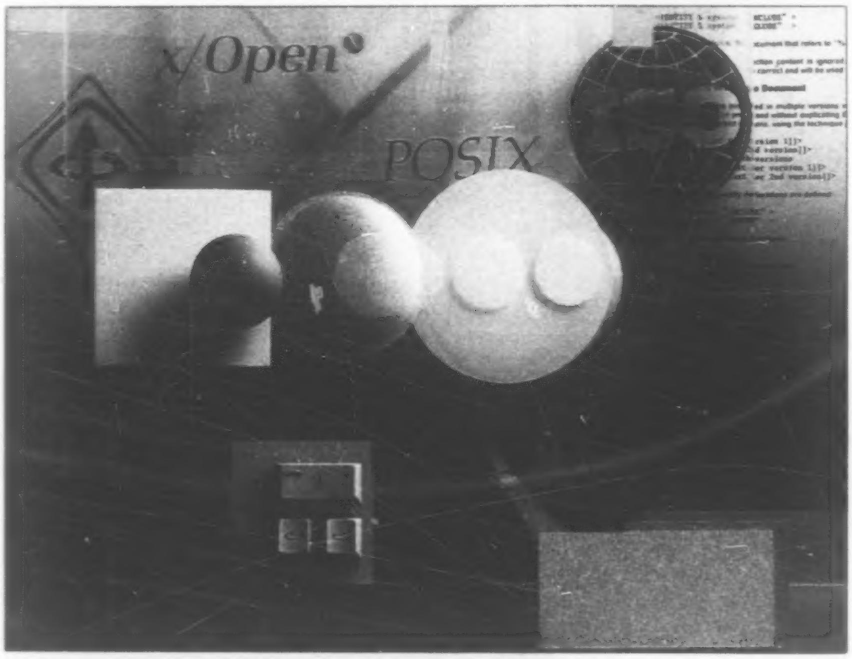
COVER STORY



With a myriad of wishes unfulfilled, users look to life beyond UNIX.

The New Agenda for Open Systems 22

BY JEFF MOAD For most IS organizations, UNIX is no longer enough to carry the open systems movement. Now, standard data definitions, databases, interfaces and protocols are the critical elements necessary for the movement to succeed.

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Recovery! 34

BY RALPH CARLYLE Users' information budgets are surging. An almost 6% increase in IS spending this year could be followed by an even bigger gain in 1991.

Spending on midrange systems is expected to dip, concurs Norbert Connors of U.S. Steel, who has just junked all his minis.

INSIGHTS ON DISTRIBUTED COMPUTING

We could have gone with workstations for our developers, but we decided it was more cost effective to go with X-terminals.

Richard VanderDrift
Oracle Corp.
PAGE 63

We may not be buying the latest and the greatest, but we will certainly be putting it to work better.

Harlan Neuville
General Motors Corp.
PAGE 70

As we thought about the network, it soon became apparent that we could interconnect the entire company, not just these design centers.

Roy Davis
Hughes Aircraft Co.
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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Expert systems allow Mrs. Fields to capture her marketing techniques from chips to nuts.

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ARTIFICIAL INTELLIGENCE

Experts at Retail 53

BY HARVEY P. NEWQUIST III Expert systems technology once failed to attract widespread IS attention because of missing links to existing systems. With the connections now falling into place, practically any business can apply AI—even retail cookie stores.

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Shearson's Image Of Groupware 61

BY ESTHER DYSON The New York City investment house is turning to PC-based electronic imaging not only to contain an explosion of paper in its back office but, eventually, to improve the way its professionals work.

Shearson's Hopfer looks to groupware to keep his shop in order.

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The Latest Desktop Contender 63

BY JOHN McMULLEN Barely visible last year, new X-terminal products are suddenly making a strong push for the desktop. But whether this intriguing technology stands much chance against personal computers remains to be seen.

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A New Vision of Quality Control 70

BY BOB FRANCIS U.S. companies' use of machine vision systems is evolving. The trend is to monitor the efficiency of the manufacturing process rather than to spot product defects.

TI's Lamkin uses vision systems to keep an eye on the whole line.

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The People Factor In EIS Success 73

BY DAVID ARMSTRONG In part II of this executive information system saga, a member of the implementation team at the North American Aircraft Division of Rockwell pinpoints the people who can make an EIS program succeed or fail.

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BY TOM McCUSKER Despite all the challenges within Hughes Aircraft's decentralized, entrepreneurial environment, the IS staff implemented an Ethernet network for engineering which evolved into a corporate backbone.

Hughes Aircraft started out networking only its design centers, but eventually the entire company got involved.

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Organizing for Future Technologies 93

BY ROGER E. WASSON Information Systems should follow the example set by the business side of a company—with one unit handling current operations and another tending to future technology.

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EUROPE

Borderless Banking Draws IS Interest

BY LINDA RUNYAN Financial firms are mounting Continental computer campaigns in order to reap the benefits of an economically united Europe. Here's a look at the IS plans of four such firms.

Special supplement, not included in all issues. 100-1

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Defining the Debate on Open Systems

A couple of weeks ago, I received a telephone call from our senior bureau manager in Los Angeles, Tom McCusker. Tom has covered the information-processing industry for 20 years for DATAMATION and has written just about every type of story on just about every conceivable topic. One of Tom's great strengths has been the freshness he brings to each new assignment. But on that day, there was an unusual excitement in his voice.

Tom was starting work on a new series for DATAMATION, which begins in this issue, on open systems. He had lined up some interviews for his part in the series and was starting to formulate some questions to ask the IS managers and supplier company executives he would interview. At that point, however, he stopped. He had a gnawing feeling that something didn't add up.

"You know, Dave, I've been writing about open systems for the past few years, and I thought I understood the subject," he said. "But, as I started getting into our new series, I realized that I wasn't quite sure how to define open systems. Something's changed." Tom, I said in reply, sit back and relax. You've got just about everything you need, but one thing . . .

Photograph by David Bradley

THE NEW AGENDA for open systems is being written by users

That one thing is our cover story this issue. Written by Jeff Moad, our senior writer in San Francisco, the story is a groundbreaking article on how IS managers and executives are redefining the open systems movement in terms of their own needs. No longer content with framing open systems simply around the UNIX operating systems, IS executives are calling for standards and interoperability across a wide variety of data, database, interface and communications definitions. These IS men and women accept UNIX. What they're now focused on is the infrastructure that will make the open systems concept—with its attendant benefits of interoperability, scalability and portability—a reality.

It's a clear message, sent honestly and openly, to anyone committed to open systems. When I told Tom what Jeff had discovered, I sensed an even greater excitement in his voice. "This will help me a great deal," he said. "I'm off and running."

Part 2 of our series on open systems, appearing next issue, will focus on what one organization is doing with open systems on an enterprisewide basis. Our Dallas-based bureau manager, Bob Francis, will be writing that one. Part 3, by Tom and senior writer Ralph Carlyle, will key in on how independent business units are implementing open systems. Part 4 will examine how supplier organizations plan to differentiate their product offerings in the age of open systems and, finally, in our June 1 issue, we will host a question and answer debate with proponents and skeptics of the open systems movement.

All in all, this series should be a keepsake. It will be one to which you will be referring for a long time.

David R. Brousell, Executive Editor

IN MEMORIAM

Edith D. Myers, a reporter and writer at DATAMATION magazine from 1970 to 1987, died March 9 from cancer. She was 59 years old and lived in Hollywood, Calif. Edith joined DATAMATION when the magazine was headquartered in Los Angeles, and wrote on a broad variety of topics during her 17 years with the publication. She retired in 1987, but continued to write about the industry. Edith is survived by three sons, Bruce, David and Eric, and two grandchildren.

EDITH D. MYERS

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BETHLEHEM STEEL'S FUGERE estimates his IS budget will rise 5 to 6% in 1990 to cover labor costs and new software.

Photograph by Picture Group, Inc.

RECOVERY!

Users' information budgets are surging. An almost 6% increase in IS spending this year could be followed by an even bigger gain in 1991.

BY RALPH CARLYLE

The key to understanding IS budgets in the 1980s was the cycle of three: boom, bust and recovery. A year of expansion would be followed immediately by a year of contraction and then by a neutral year. The same key may unlock some of the mystery shrouding the industry as it enters the 1990s. In this, the first year of the new decade, the cycle seems to be on course: the IS budgets of major U.S. users are recovering—to the tune of nearly 6% increases in outlays for personnel, products and services.

This recovery, if left unscathed by world political and economic events, would be the last year of the second such cycle DATAMATION has observed since 1985, when the magazine began exhaustive measurements of IS spending patterns in the United States. More important, the recovery could presage a boom in technology investments planned by U.S. corporations and agencies for 1991.

There have been no back-to-back boom years or consecutive years of slumping fortunes in the six IS spending surveys conducted by DATAMATION. In 1985, respondents to our survey projected a 7.4% increase (boom) in IS outlays. In its wake came the 1986 bust of 4.2% and a recovering 5.1% in 1987. The cycle began once more with the 1988 high of 7.8% and last year's slump of 4.4%.

Respondents this year figure on 5.9% increases in their overall 1990 IS budgets. They expect to invest almost as much of their resources in personnel (41.3%), technologies (40.7%), overhead (10.1%) and outside services (7.9%) as they did in 1989, with slight variations.

If the pattern for total IS spending holds true, we can expect an almost 8% expansion in the budget next year, followed by relative slump, recovery and so on. But how, the wary IS executive might ask, can there be such a predictable rhythm in such an uncertain world?

Getting a Fix on Variable Costs

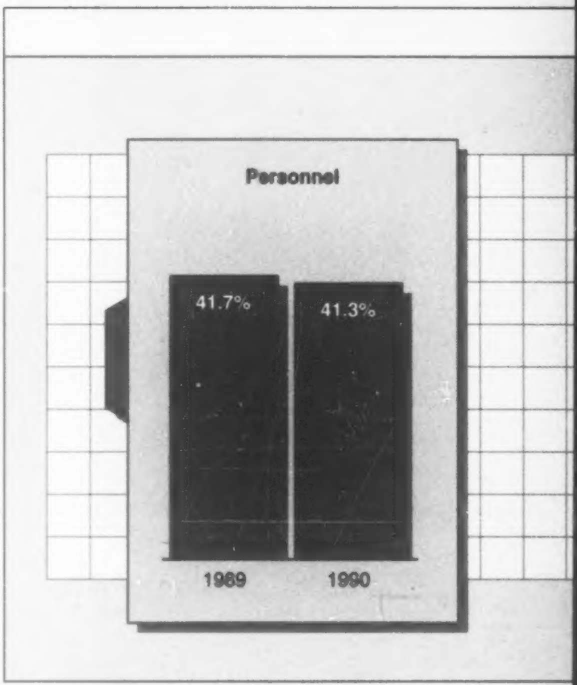
One answer lies in the ratio of fixed to variable costs present in all IS budgets. Of the four main components of the budget: personnel, technology investments, overhead and outside services, the first three have proved to be relatively fixed and predictable—with the exception of software pricing. And when these first three components have not been predictable, executives controlling the budget have endeavored to make them so.

Take, for example, the traditional home of the IS department: the data center. Since 80% of data center costs are relatively fixed (people, overhead, capital equipment etc.), and since a boost in transaction volume results in scale-related cost reductions, the sensible course is to reduce the number of dispersed data centers. The result is to create fewer but larger centers. Companies are now doing this with increased frequency. (For more on such consolidation see the next issue of DATAMATION.) Data center consolidation reduces the fixed overhead and people costs, making the remainder more manageable and predictable. At the same time, such consolidation creates economies of scale that can result in further cost reductions.

Vendors have also contributed to a more predictable budget. IBM has settled into a yearly pattern of offering 25% more mainframe hardware throughput for the same price. A predictable decline in hardware prices is a feature of other machine classes across the industry as well, although the advent of reduced instruction set computing (RISC) processors could wreak havoc with this model.

Personnel costs typically consume 40% to 50% of a user's total IS budget. It's equally certain that hardware/software/communications purchases will consume 35% to 45% of the total budget. Where a company fits in the spectrum depends on whether it is in the public, manufacturing or services sector.

George T. Fugere, vice president of information services at Bethlehem Steel Corp. in Bethlehem, Pa., estimates that his 1990 IS budget ratio of fixed to variable costs is 75:25%. The process-manufacturing industries have traditionally typified the yearly averages in DATAMATION's cycle of three.



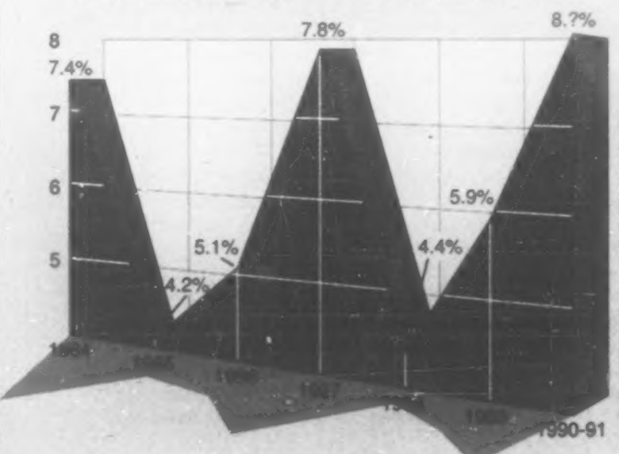
The variable aspect of the steel maker's IS budget depends entirely on how much systems development work the department must do in any particular year. Because demand from clients will be heavy in 1990, Fugere's budget will rise 5% to 6% to cover associated IS labor costs and increased use of outside software companies.

Demand for IS Workers Is on the Rise

Respondents to this year's DATAMATION survey expect their departments to grow robustly, and they emphasize the increased importance of information technology (and by association, IS professionals) to

The IS Spending Cycle Should Continue Unless Smashed by Stronger Forces . . .

If user spending on information systems holds true to form, 1990 investments will be surpassed in 1991.



SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

The years 1992–1999 could be affected in a positive way by turning over these wild card variables:

VARIABLES

- Inflation/Interest Rates

In many companies, top IS executives and their budgets are now protected from changes in the inflation rate. As they prepare their budget, they are given a formula from the financial department that they must use to compute personnel and employment costs. This formula is preadjusted to take into account any variation in the inflation rate expected that year.

- Changing Economics of Technology

Companies are today attempting to automate whole clusters of applications simultaneously as they build their networks, where once they focused on one application at a time in a sequential manner.

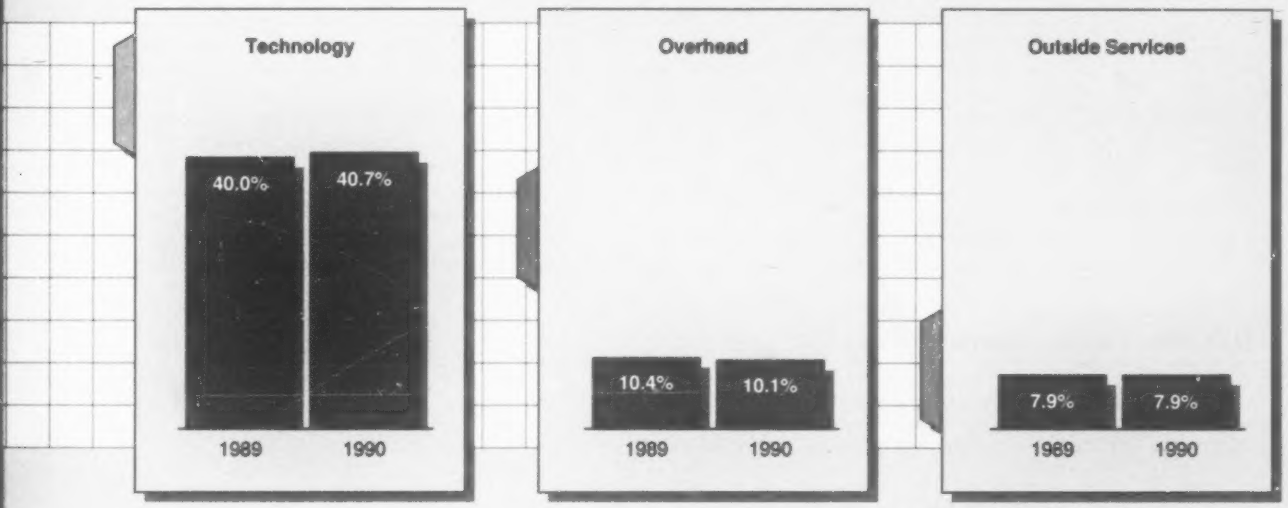
- Interdependent Global Economies

It's well known that the Japanese and other nations have used long-term investment to gain market share. Many corporate chiefs aren't prepared to wait for such changes in the United States and believe that privatization of their companies is the best answer. Privately owned companies aren't answerable to public stock holders or the ruthless logic of the quarterly balance sheet and can lock into long-term IT investments.

SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

Where 1990 IS Spending Dollars Are Going

Traditionally, personnel, technology and overhead costs have been relatively fixed and predictable. The only real variable in this year's budget, and a small one at that, is the spending on outside services.



SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

their organizations. So like Fugere, their budgets will grow an average 5.9% in 1990 and, unlike those in last year's survey, they are hungry for IS workers. The size of the staff reporting directly to the average IS department (including contract staff from outside software companies) will increase by over 13% to 32 IS workers in 1990, the survey reveals.

A factor in the variable portion of the budget is software pricing. Although, for example, IBM's hardware pricing has been predictable, its software hikes have been erratic. Fugere says his department has often been unprepared for software price hikes. "We've been caught many times." says Fugere. The best you can do, he says, is discover whatever rhythm or pattern exists in IBM's software pricing and leave some slack in the budget for the years you think you'll get hit. Advice from one of IBM's biggest commercial customers, Aetna Life & Casualty Co. of Hartford, Conn., is more pointed. "Find ways to turn your IBM reps into employees of your company, not of Big Blue," says Irwin Sitkin, who recently retired as Aetna's vice president of corporate administration. "Get them to ferret out the data you need for budget planning."

Outside contractors will always remain a variable. "When clients demand more than you can deliver, you use them to get out of a bind," says Fugere. "When bust years come you cut them back."

But there are other outside variables that aren't so easy to control. Inflation, interest rates, the changing economics of technology and the increasing economic interdependtence of nations across the world. Despite the existence of new stabilizing influences on IS budgets, such variables could break the cycle of three anytime during the rest of the decade. Sudden, unforeseen changes in, let's say, the Japanese banking or stock trading system could trigger a recession in the United States.

Perhaps the biggest variable is the impact on IS spending created by a change in thinking about how information technology should be deployed in organizations. By and large, users in the previous decade allocated IS resources in piecemeal fashion. They dealt with problems one application at a time in a sequential manner. In the new decade, users will attempt to automate whole clusters of applications simultaneously as they build their networks.

"To do so they must lock into long-term IT investments that may or may not result in big paybacks five years or more down the road," says Rod F. Monger, an

Or Unprotected by Stabilizing Forces

Many IS user organizations are creating buffers to guard against budget turbulence.

STABILIZERS

- Service Level Contracts
Pacts between IS departments and the business units they support should minimize the possibility of information systems investments getting out of hand. IS now is everybody's budget.
- Accounting Changes.
Don't be surprised to see the rule-making bodies in U.S. accounting make significant changes in policy in order to right the imbalance between U.S. and foreign companies.
- Privatization.
If CEOs can find new sources of funding now that junk bonds are out, you'll see more and more publicly held companies taken private. That will enable them to invest in information technology for the long term—escaping those incessant quarterly phone calls of Wall Street analysts.

SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

analyst at the Research Board in New York City. Since the nation's accounting system doesn't encourage such long-term investment, here we have another unknown. Some corporate leaders and gurus from the accounting profession are already calling for reform of the U.S. accounting system. One idea is to do away with quarterly reporting and start with the yearly picture.

It's well known that the Japanese and other nations have used long-term investment to gain market share. Many corporate chiefs aren't prepared to wait for such changes and believe that privatization of their companies is the best answer. Privately owned companies aren't answerable to public stock holders or the ruthless logic of the quarterly balance sheet and can lock into long-term IS investments.

"Privatization is a growing trend," says Monger, who predicts that such a trend could bring about more long-term investment in information technology and have a major positive impact on IS budgets. Should there be a substantial overhaul in the U.S.

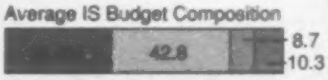
How the Competition Stacks Up

▇ **Personnel**

If you feel like your organization is spending less than its rivals, here's a way to make your point. By comparing your IS budgets against industry averages, you should be able to measure just how competitive you are.

Manufacturing/Industrial

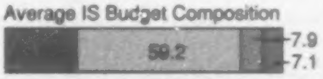
Average Annual Revenue per Company $1.5 billion
Your Company's Annual Revenue ______
Average IS Budget $1.7 million
Your Company's IS Budget ______
Average IS Budget Composition



Your Company's IS Budget Composition

Banks/S&Ls

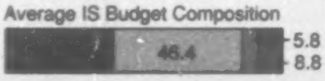
Average Annual Revenue per Company $437.4 million
Your Company's Annual Revenue ______
Average IS Budget $1.0 million
Your Company's IS Budget ______
Average IS Budget Composition



Your Company's IS Budget Composition

Insurance

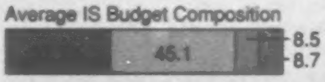
Average Annual Revenue per Company $1.6 billion
Your Company's Annual Revenue ______
Average IS Budget $2.5 million
Your Company's IS Budget ______
Average IS Budget Composition



Your Company's IS Budget Composition

Retail Trade

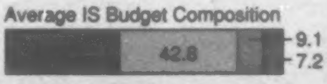
Average Annual Revenue per Company $470 million
Your Company's Annual Revenue ______
Average IS Budget $1.4 million
Your Company's IS Budget ______
Average IS Budget Composition



Your Company's IS Budget Composition

Wholesale Trade

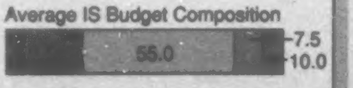
Average Annual Revenue per Company $46 million
Your Company's Annual Revenue ______
Average IS Budget $2.4 million
Your Company's IS Budget ______
Average IS Budget Composition



Your Company's IS Budget Composition

Transportation

Average Annual Revenue per Company $12.4 million
Your Company's Annual Revenue ______
Average IS Budget $4442.5 million
Your Company's IS Budget ______
Average IS Budget Composition



Your Company's IS Budget Composition

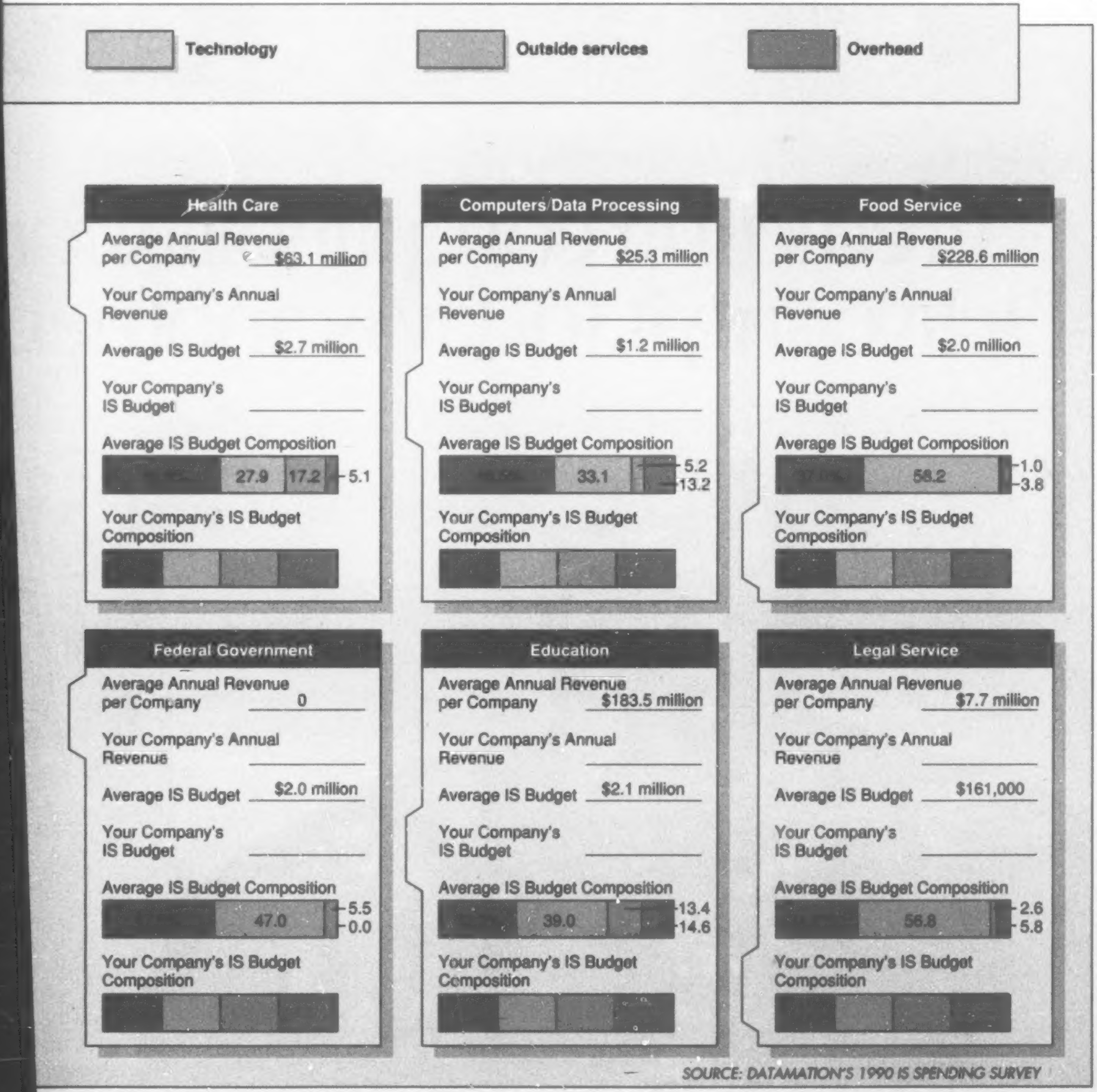
There have been no back-to-back boom years or consecutive years of slumping fortunes.

accounting system, and in the current structure of corporate ownership, IS budgets will be transformed. The thinking being that if U.S. companies have incentives to invest in the future, they will commit greater resources to information technology in the present.

Of more immediate concern to the cross section of CEOs, financial officers and top IS executives polled in this year's budget survey is another wild card: inflation. Coupled with rising interest rates, inflation could undermine IS budgets in 1990. The executives also say downsizing, a higher U.S. dollar and a diminishing pool of highly skilled IS personnel could curb budget growth.

As natural as it is to fear the unknown, it is possible that IS budgets in the 1990s could be buffered from such outside variables by an idea that has caught on in the 1980s: the service level agreement.

The 1970s and early 1980s brought wild swings in IS budgets, and spending could sometimes soar as much as 20% a year or more. "Five or six years ago, we were in double-digit growth," says DuPont vice



Health Care

Average Annual Revenue per Company $63.1 million
Your Company's Annual Revenue ____
Average IS Budget $2.7 million
Your Company's IS Budget ____

Computers/Data Processing

Average Annual Revenue per Company $25.3 million
Your Company's Annual Revenue ____
Average IS Budget $1.2 million
Your Company's IS Budget ____

Food Service

Average Annual Revenue per Company $228.6 million
Your Company's Annual Revenue ____
Average IS Budget $2.0 million
Your Company's IS Budget ____

Federal Government

Average Annual Revenue per Company 0
Your Company's Annual Revenue ____
Average IS Budget $2.0 million
Your Company's IS Budget ____

Education

Average Annual Revenue per Company $183.5 million
Your Company's Annual Revenue ____
Average IS Budget $2.1 million
Your Company's IS Budget ____

Legal Service

Average Annual Revenue per Company $7.7 million
Your Company's Annual Revenue ____
Average IS Budget $161,000
Your Company's IS Budget ____

SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

In the new decade, users will attempt to automate whole clusters of applications simultaneously.

president of information systems Raymond E. Cairns of his company's past IS spending habits. Increases in IS outlays these days at the Wilmington, Del., chemicals giant barely match the growth of inflation as Cairns' department competes with other functions within DuPont for limited amounts of financial resources.

The reason IS budgets flew as fast as they once did and grounded to a near halt just recently has much to do with the customers of most IS departments—the functional areas of businesses that make them tick. "The business units didn't tell us exactly what they wanted, and they kept changing their requirements," Bethlehem Steel's Fugere replies when asked to account for those double-digit IS budget growth days of yore. "When costs escalated, IS became the fall guy," he says in explaining why budget growth trailed off.

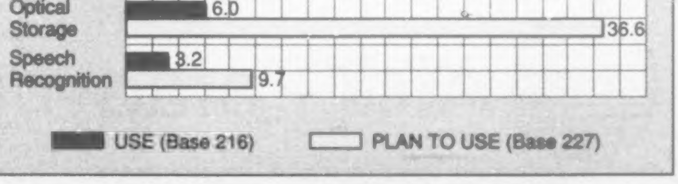
With the advent of service level agreements, that has all changed. Today, it is the business unit that must justify its portion of the IS budget, describe precisely what it wants done and be accountable for the money spent. The IS department signs a contract, a service level agreement, when it feels it can fulfill these requirements over the year ahead. The clients also sign the contract and become equally accountable for the work.

In many companies, top IS executives and their budgets are now also protected from changes in the inflation rate. As they prepare their budgets, they are given a formula from the financial department that they must use to compute personnel and employment costs. This formula is preadjusted to take into account any variation in the inflation rate expected that year.

Using service level agreements and inflation-buffering formulas, information systems and its clients can break up long-term IT investments into executable chunks. Emerging technologies, notably computer-aided software engineering (CASE), help by providing better measures of productivity and management of the ongoing software development process.

Emerging Technologies

Image-related products and services are capturing a lot of the IS dollars earmarked for nascent technologies. The chart shows the percentages of respondents who say they use or plan to use the following technologies.



Future Predictions

Only modest swings in IS budgets will occur in the 1990s, even with all the wild cards and uncertainties that characterize the outside environment, Fugere and other IS executives predict. A retreating economy, for example, won't even bring out everybody's budget axe. Some 52% of the IS and financial executives polled in this year's survey say that a recession in 1990 would have no impact on their budgets. Nearly two out of three executives, in fact, believe there will be no recession in 1990. Particularly adamant about this are the retail trade, insurance and process industry sectors.

Such antirecessionary feelings of course go hand-in-hand with a positive attitude toward revenue growth. Most U.S. executives think their businesses will grow heartily in 1990—expressing little or no fear that Pacific Rim or European rivals will best them. Moreover, it's apparent that they are counting on information technology to fuel such growth. Little else could explain why most users are planning significant increases in IS staffing—at a time when most other areas of corporations and agencies are under the chill of hiring freezes.

The IS Work Force Is Expanding

Respondents, typically from companies with 1990 revenues above $1 billion, are projecting a 13% increase in the number of staff reporting directly to the IS department. Demand is strongest in the manufacturing/industrial sector (a 19.2% increase) and least pronounced in the public sector (0.6% increase). But in none of the 27 industry categories on the survey was a decline in workers reporting to the IS department forecast.

Also growing strongly is "The New IS Force," a phrase coined in DATAMATION's August, 1, 1989 cover story (p. 18) on those full-time IS professionals who generally reside in business units. These dispersed workers constitute almost 34% of all IS professionals in the user organizations surveyed, and their numbers will grow 8.5% to an average 21.3 workers per company this year. Some organizations, of course, are employing this new force to greater degrees. At DuPont and MCI Communications Corp., for example, IS chiefs say that 75% of their organizations' IS work forces call business units—not headquarters—home.

In the minds of managers at large and small user organizations, the importance of information technology to their enterprises and the growth expected of the enterprises themselves are fueling demand for more IS workers. Curiously, another reason is corporate streamlining—particularly at companies with fewer than a thousand employees of all types. Almost six out of ten managers see streamlining as having a beneficial effect on their 1990 IS budgets—

reinforcing the notion that information technology and its masters (IS workers) are enabling companies to trim away unnecessary fat.

Streamlining has an organizational connotation; it implies squeezing out inefficient layers of managers and workers. It shouldn't be confused with downsizing, which refers to switching from large computer systems to small ones. In fact, 61% of executives polled by DATAMATION regard downsizing as detrimental to budget growth.

Other reasons cited for the increase in the IS rank and file are the merger of voice and data operations (bringing communications employees under IS' umbrella), and the recentralization of the data center function within the organization.

Although the management over data center functions is returning to corporate headquarters at many user organizations, the processing power of IS continues to become more widely distributed throughout corporate domains, particularly at the PC level. It's clear from the survey that along with distributed computing has come distributed responsibility for information technology. This is perfectly natural when you consider that information technology typically consumes at least 30% of a company's capital spending budget.

Non-IS Influence

It's hardly surprising, then, that almost a third of all IS investments by user organizations surveyed by DATAMATION are made without any involvement from central IS influences. In addition, there are an increasing number non-IS employees with buying or specifying authority over information technology: an average 5.4 persons per company, an increase of 14% over last year.

Change is also evident in the way organizations are deploying these IS resources. In last year's survey, 49% of IS investments supported back-office applications. This year, it has declined to 38%, as mission-critical applications in manufacturing, distribution and sales/marketing have grown to consume the bulk of IS dollars.

Highlights of the 1990 IS Budget Survey

Some patterns clearly emerge in this year's spending outlook.

- The public sector is projecting a 7.2% increase in IS spending. The manufacturing/industrials sector expects an increase of 5.3% and the services sector, 5.2%. The average for the three, 5.9%, should outrun inflation which was 4.9% last year and is expected to exceed 5% in 1990.
- Some 63% of respondents say there will be no recession this year. A majority also state that even if there is a recession, it will have no impact on the IS budget.
- Demand for IS workers, both in the traditional IS department and in business units, is up appreciably over last year: 13.1% for the former and 8.5% for the latter.
- Stand-alone PCs are a diminishing percentage of total IS hardware revenue for the second year in a row. Favored instead are emerging small, multiuser systems.

SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

Such front-office applications are built on desktop systems—but not necessarily on the single-user personal computers of yesterday. For the second year in a row, PCs are commanding a smaller—albeit still dominant—portion of technology investments than before. In 1990, PCs will capture only 34.6% of the budget for new hardware, software and communications products—down from 39.6% in 1989.

Instead, what's likely to support these new applications are small multiuser systems that can range from networked high-performance workstations and servers to the low end of midrange systems. Spending on multiuser systems, which usually run on second-generation PC operating systems like OS/2 or on UNIX, is expected to consume 11.4% of user resources for new technologies—a big jump from the 8% they devoured last year. These systems also may be small midrange systems, such as the low ends of IBM's AS/400 line and Digital Equipment Corp.'s VAX 6000 family, that serve the needs of a half dozen users, come bundled with database and operating systems and feature canned industry-specific software. Servers, such as Compaq Computer Corp.'s SystemPro, members of Sun Microsystems Inc.'s SPARC line and IBM's new RS/6000 family, also promise to capture multiuser dollars.

The public sector remains the biggest supporter of stand-alone PCs. Big orders for laptops and other systems will boost government spending on PCs by some 20% between 1989 and 1990, according to the survey. But small companies, especially those with up to 250 employees, are reducing their dependence on stand-alone PCs. And so are a growing number of industry sectors—particularly wholesale trade, food service, nondurable goods manufacturing and the process industries.

Minispending on Minis

The traditional minicomputer is also under siege. Medium and high-end midrange machines, those priced between $100,000 and $1 million, will attract merely 7.2% of the dollars that users spend on new hardware, software and communications. That's down from 7.4% a year ago. Not a big percentage as yet, but confirmation of the trend noted in the Cowen & Company/DATAMATION's Mini/Micro spending survey (See "The Desktop Dimension," DATAMATION, November. 1, 1989, p. 28), which revealed that the dollar value of minicomputer shipments would fall 10.5% between July 1989 and June 1990. That's the first such decline in the 16-year history of the survey.

Turning against the mini are banks, insurance companies, retailers, health care providers, educational institutions and, especially, process-manufacturers. Process industry spending on midrange systems will be down 37% this year. "It's hard to conceptually justify a midrange [system]," explains Norbert J. Connors, comptroller of computer services centers for the USS Steel Division of USX Corp.

> **Streamling has** an organizational connotation; it implies squeezing out inefficient managers and workers.

U.S. STEEL COMPTROLLER CONNORS says it's hard to justify spending on midrange systems.

Photograph by Scott Goldsmith/Black Star

in Pittsburgh. His company has junked all its minis and moved to a two-tier hardware architecture of large central hosts systems linked to dispersed multiuser systems.

But the mini has plenty of defenders, notably in the wholesale trade sector, which is throwing out stand-alone PCs and adding midrange systems. Another stalwart user of minis is the nondurable goods manufacturing industry. Companies in the 100 to 250 employees range will be the biggest buyers of minis in 1990, the survey reveals.

Big Iron Is a Big Target

Another hardware institution, the venerable mainframe system, is also under fire. IBM is coming to the end of a long eight-year mainframe cycle, and it shows in our survey. Large-scale systems spending will be off 20% as such MIPS monsters slip to represent merely .8% of all technology investments by users. This statistic may be a function of the survey sample, which draws from a cross section of companies—small, medium and large—in the United States. Many may not have large-scale systems installed in their organizations or at least not have widespread purchasing authority for them. Indeed, the DATAMATION 100 survey of the world's top information technology suppliers shows large-scale systems to be alive and well—accounting for 12.5% of worldwide industry revenues in 1988.

Mainframe spending has also been hit by industry consolidation. Untold numbers of data centers have been shut down in recent years, only to be replaced by fewer megasized complexes. "There's too much fat in the DP budget," says Mike Zucchini, chief information officer at the Fleet Navistar Financial Group in Providence, R.I. "And most of it is in the form of dispersed mainframe-based data centers."

The mainframe sniping in the United States may be a temporary phenomenon, some experts believe. The first of IBM's large systems family for the 1990s, "Summit," should ship late next year. Customers are expected to open their coffers for Summit to be able to mount new databases and business critical applications such as imaging and computer-integrated manufacturing.

The survey shows a healthy appetite remains for large system memory, disk and tape storage after consolidation. For example, the percentage of the IS budgets in 1990 allocated for disk/tape subsystems at companies with more than 1,000 employees is expected to grow 42%—even with far fewer new mainframes around.

On Software & Outsourcing

Although each hardware category has its champions and its detractors, the survey population agrees that software rightfully occupies center stage. Demand for systems software is up, while investments in applications software are down. What explains such behavior in a decade when users say they are devoted to applying information technology to every corner of their enterprise? Perhaps users are investing in new systems software, notably products such as OS/2 and UNIX, in anticipation of new applications they intend to build with future IS budgets.

Supporting this line of thinking is the outlook for spending on database software. Since so many applications are built on databases, many people put database software in the same category as systems software. Nearly 3% of all IS investments in new technologies will go toward database software. Measured as a portion of the average user organization's total outlays for software of all types, database products consume nearly 16% of such spending.

The budget survey always throws light on some controversial subjects, and this year is no exception. Outsourcing, the farming out of IS work to software companies and other vendors, is a continuing trend. Although some fear it will eventually undermine the whole IS profession, our survey doesn't support such a view. IS spending on outside services only amounts to 7.9% of the total. There is some cause for concern, however, at large organizations—those with 1,000 or more employees—where it's a different story. At such companies, the percentage of outsourced money is growing much faster—18% from 1989 to 1990.

The survey also reveals that CASE, imaging and RISC technologies are taking off. Especially notable is the increased investment in optical storage products. Although only 6% of survey respondents currently use this technology, nearly 37% plan to do so by the end of the year.

Such a willingness to spend on emerging technologies always has characterized the budget habits of IS users. If 1991 holds true to form, new products and services and all the other boats in the IS ocean will benefit from a rising—perhaps cresting—tide next year. This year's survey certainly suggests that smart user organizations are bringing the right IS hands on deck to see that such investments speed them on their competitive courses. ▭

Experts at Retail

Expert systems technology once failed to attract widespread IS attention because of missing links to existing systems. With the connections now falling into place, practically any business can apply AI—even retail cookie stores.

BY HARVEY P. NEWQUIST III

Over the past decade, the business of artificial intelligence (AI) has been the computer industry's equivalent of Madonna: flashy and sensuous with a hint of mystery, but perhaps lacking in substance. While fans of the technology applauded its inherent potential, critics derided it as being vapid and overhyped.

But AI, most notably in the area of expert systems, is beginning to force its way into places one normally wouldn't expect to find it. As a result, it is commanding some respect and praise for its effect on corporate bottom lines in company environments ranging from United Airlines Inc.'s passenger gates to the trading floor of the Chicago Board of Trade.

Perhaps the significance of this ongoing advance of AI is best seen by its recent foray into the retail sector. The 1990s is already heralding a substantial increase in the number of AI systems deployed, as well as the number of organizations beginning to integrate AI into their overall IS strategy.

Integration Is Key

Part of the problem historically with expert systems and other forms of AI were the promises of human-level performance in tasks that required expertise, logic and experiential knowledge. These promises, however, failed to include such "minor" features as the ability to integrate into existing systems, portability over different architectures within an organization, compatibility with installed software and price/performance benefits. At least that's the way the original AI pioneers approached these IS essentials. Needless to say, users didn't exactly trample over themselves in the rush to buy AI software.

Beginning in 1988, user demand for standard systems characteristics became vehement enough that AI vendors almost universally began offering features that had been missing for most of the decade. This demand was driven mostly by engineers forced to work with "real world" systems already installed at large manufacturing companies in the automotive and aerospace industries.

Today, widespread use and integration of expert systems technology has become a fact of life. No longer confined to those areas that have traditionally been attracted to AI—notably the manufacturing and financial services industries—expert systems can be found in law enforcement, marketing, personnel management and a host of other nontraditional computer use sectors.

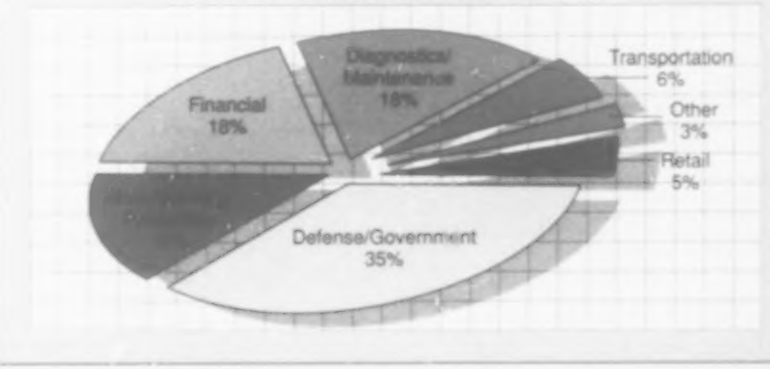
Retailer are perhaps the most interesting of the latest expert system subscribers. That's because few competitive business environments are so dramatically affected by subjective consumer whims. Everything from a store's location to the color of its floor tile can have an impact on retail sales. Something as seemingly insignificant as changing the piped-in music from Metallica to the more laid back Billy Joel can improve a store's floor traffic and sales potential. Therefore, expertise and an acute sense of market demands are essential to successful retailing.

Packaging that expertise into an expert system can provide inexperienced or poorly performing managers with top-level decision-making and planning. To drive the point home, this article examines several applications that were developed using tools from what many in the AI community might consider an unlikely source: IBM. Most expert systems are developed using tools from a variety of AI-specific software companies, but IBM's own offerings in this arena are growing in popularity. One of IBM's most recent contributions is a complete AI development environment called The Integrated Reasoning Shell or TIRS.

The success of AI in retailing, and IBM's role in developing expert systems, serve to illustrate that AI success stories are no longer limited to cold, dark corners of engineering and research labs. Nor are they managed by individuals who only speak of AI in terms like "sideways fuzzy logic chaining" and "backward propa gation of constrained inference parameters." Rather, AI and expert

Look Who's Shopping for Expert Systems

Practically invisible a year ago, expert systems for retailing now command 5% of the total market.



Source: The Relayer Group

systems are here to stay.

Best known as the purveyor of choice chocolate chip cookies, Mrs. Fields Inc. of Park City, Utah, is also a preeminent user of expert systems technology. The company uses AI to assist in almost every area of its retail operations, and it has been so successful in applying AI that it now markets its own expert systems software through a subsidiary, Fields Software Group, also in Park City.

Since its founding in 1977, Mrs. Fields has attempted to use computers to handle most paper-pushing tasks and basic operations management. This was largely due to the fact that founder and chief operating officer Debbi Fields' husband, Randy, had worked for years as an IBM systems programmer.

Initially, Randy's fundamental belief in computers allowed the Fields to handle basic data management tasks such as sales and inventory control. As the company grew, this IS base provided the infrastructure for corporatewide e-mail networks and more sophisticated transaction processing. This is especially important for a company that has grown to include more than 700 cookie outlets, 100 La Petite Boulangerie pastry and delicatessen stores and dozens of Fox Photo stands.

Chips Off the Old Block

But more important to the Fields than simply monitoring basic business functions of stores was the preservation of what made the original stores successful in the first place—Debbi Fields' personal marketing techniques.

On slow days at her first store in Palo Alto, Debbi would offer free cookies to passers-by outside the store. She would first bake a day's worth of inventory based on past experience and then would set sales goals for herself each day. But as her business grew into hundreds of U.S. stores, Debbi Fields could no longer practice her cookie marketing expertise in each store.

☐ USERS DIDN'T EXACTLY TRAMPLE OVER THEMSELVES TO BUY AI SOFTWARE.

The Fields decided to go the next best route: to try to capture her experience in expert systems that every store could access at any time. Thus was born the company's Retail Operations Intelligence systems (ROI).

Beginning on an IBM mainframe using Big Blue's Expert System Environment (ESE) software, the company set out to provide its store managers with software that could deliver accurate analyses of business conditions, as well as address most business predicaments or personnel situations that might arise. From the development of basic retail systems came a host of integrated software modules that today form the core of Mrs. Fields ROI software: Sales Reporting & Analysis, Daily Sales Capture, Labor Scheduler, Daily Production Planner, Interviewing, Skill Testing, Time Collection and Inventory. All of these components runs on a PC linked into IBM AS/400 or System 38 minicomputers installed in Mrs. Fields' Utah headquarters. The minis are used for nationwide data collection and communicate with the PCs using toll-free dial-up lines.

The modules are designed to work together, but each has its own specific area of retailing expertise. For instance, the Labor Scheduler takes full advantage of Mrs. Fields' headquarters executives who have had years of employee management experience in areas like employing minimum-wage personnel, the predominant counter help at most cookie stores. The LS module schedules employees based on knowledge of labor and work force-related conditions, including the labor laws of a particular state, employee work preferences and store characteristics. Using knowledge-processing techniques, it draws up a work schedule, including breaks, to optimize hourly employees' time. A store manager can therefore minimize overtime and provide workers with a potentially more flexible schedule.

Because many retail employees tend to stay with any particular job longer for less than a year, interviewing prospective employees is an ongoing task at every store. The Interviewing module of ROI is designed to help store managers assess the potential of prospective store personnel. It also provides a way to make sure that each employee is asked the same set of questions, a process that helps separate the potential malcontents from future employees of the month.

For the ultimate day-to-day retail operation, there is the Daily Production Planner, an expert system that serves as an intelligent and interactive appointment book, diary and to-do list bundled into one. All store managers log into this application about 30 minutes before the stores open and enter specific information about the day. In the case of a potentially high-traffic day for cookie sales—say Valentine's Day—the system will check traffic through the store in past years on that date and will also factor in such things as weather conditions.

The Planner creates a full day projection of the amount of dough that must be prepared. It continues this process on an hourly basis to chart actual store traffic and progress and may make decisions on cutting back production or even offering free samples to passing customers to increase sales. All of this is designed to place the emphasis on food retailing where it counts—maximizing profit potential but minimizing leftovers and loss. At the end of a day, a Mrs. Fields store

Mrs. Fields Software Spinoff

Based in Park City, Utah, The Fields Software Group is a division of cookie queen Mrs. Fields Inc. that sells retail management software based on expert systems technology. Although Mrs. Fields may seem an unlikely source for artificial intelligence software, the company's success with its homegrown expert systems encouraged executives to offer the modules to other retailers through its own software sales company. In this way, Mrs. Fields has not only capitalized on its own expertise in house but now makes money selling that expertise to others.

The Fields Software Group's packages are sold in modules for PC-based systems. Each module, or Retail Operations Intelligence system (ROI) is designed to deliver expert advice on specific areas of interest to retailers, including daily sales, labor scheduling and personnel management.

While some companies are reluctant to disclose their developments in AI because of the strategic advantage that expert systems deliver, Mrs. Fields has no such qualms with its ROIs. Although the ROI prepackages much of the information required to create a custom expert system, each module still has to be tailored to a specific buyer's needs. As a result, an ROI-based system for the cookie business can wind up looking quite different than one applied in an auto parts store. The modules can be purchased for approximately $500 to $1,000 apiece, with the entire ROI system retailing for $8,000.

manager can measure performance against projections and then use all of those data again next year to help boost sales.

Retailing, California Style

The Broadway, a subsidiary of Carter Hawley Hale Stores Inc. (CHH), is a Los Angeles-based chain of 43 department stores performing some 57 million customer transactions a year in what can easily be considered the most fiercely competitive retail and fashion market in America: Southern California.

In a land where conspicuous consumption is a way of life, customer service and highly qualified retail managers help to determine success or failure of a retail operation. And for the department store business, which has seen a recent spate of bankruptcies and a For Sale sign hung on Bloomingdale's, every consumer dollar won at the expense of competitors can mean the difference between ongoing White Sales or a Going Out of Business sale.

At The Broadway, the everyday management of each store is handled by area sales managers (ASMs), many of whom are recent college graduates with only a few years of actual retail experience. The 645 ASMs employed by the company are expected to competently manage store salespeople; analyze sales reports; deal with customers; and plan six-month retail strategies based on market trends, fashions and fads.

More Than a Fashion Statement

Human nature being what it is, some managers were performing better than others. In an attempt to create consistency, senior executives at both The Broadway and parent Carter Hawley Hale, notably Information Services chief Vince Conant and Broadway president Richard Clayton, began exploring knowledge-based systems as a potential avenue for increasing managers' performance.

The Broadway had been fully automated for some time, relying on a variety of IBM architectures for interactive gift registries, credit processing and sales transactions. In the end, Broadway selected IBM's ESE tool for mainframe development.

To begin building the knowledge base, eight of the top-producing area sales managers were recruited to provide the heuristics (rules of thumb) for a system that would become known as the Area Sales Manager Expert System Consultant. Based on ongoing interviews and knowledge-gathering sessions with these ASMs, The Broadway's internal systems developers came up with six modules addressing critical areas of ASM job performance: sales techniques, staffing, product knowledge, product procurement, floor layout and motivation.

WHEN MRS. FIELDS INC. grew too big for the founder to influence each store's marketing methods, the company cloned Debbi Fields' expertise in an expert system.

Initial development of the system took nine weeks, which is a far cry from the standard 18 to 36 months required for AI prototyping in the early 1980s. What's more, fewer than five programmers were working on the project at any one time, and all of them already belonged to the IS department.

The system was beta tested in two Southern California Broadways during the spring of 1988. Early ASM users were given a training course in the system and then given access to use it on their own. When sales figures for the stores showed a marked uptick, The Broadway's management decided to deploy the expert system in every location. This process took about a year, and now every Broadway store is on line with the ASM Expert System Consultant running on IBM mainframes under MVS/TSO. There is talk within the company of delivering the system on PCs and even installing it in every one of CHH's 114 stores nationwide.

☐ **AI SUCCESS STORIES ARE NO LONGER LIMITED TO COLD, DARK CORNERS OF RESEARCH LABS.**

As a user works his or her way through each of the modules, the system asks for store-specific data such as average sales per hour and current sales as compared with last year's sales. It then pinpoints areas of concern, as well as strong management strategies and characteristics.

Many of The Broadway's ASMs find that the immediacy of strategy analysis based on current sales figures and general store performance helps them to make critical decisions much more quickly—something that can be very important in day-to-day retailing. The company is now working on other expert systems, including a staple stock adviser, which helps to control the inventory and ordering processes of the 1.5 million different stock items that The Broadway carries.

As all retailers begin to automate and then add intelligence to their computer operations, certain companies are going to have the benefit of utilizing these tools over longer periods of time, establishing themselves as masters of data analysis and manipulation, as well as initiators of strong competitive strategies. It is conceivable that expert systems might even work their way to the point of purchase level, where retail systems help buyers decide which clothes or meals to buy.

Bringing Intelligence to Colleges

Zenith is in the process of putting just such a system into college bookstores to help students determine the types of software and hardware that will meet the needs of their course curricula and pocketbooks. Just as shopping malls currently feature computerized directories, individual stores may someday soon offer touch screen expert systems that entice customers to buy those items that come closest to meeting their special requirements. And for some people—especially those fashion victims who choose to wear plaid pants and striped shirts—retail expert systems like this could also be doing a community service. ▭

Harvey P. Newquist III is chief executive officer of The Relayer Group in Scottsdale, Ariz., which publishes the AI Trends Newsletter *on the business of artificial intelligence.*

Diversity at the Low End

Despite all the differences between their various countries and cultures, European IS users share common attitudes that are shaping the structure of the PC and workstation market.

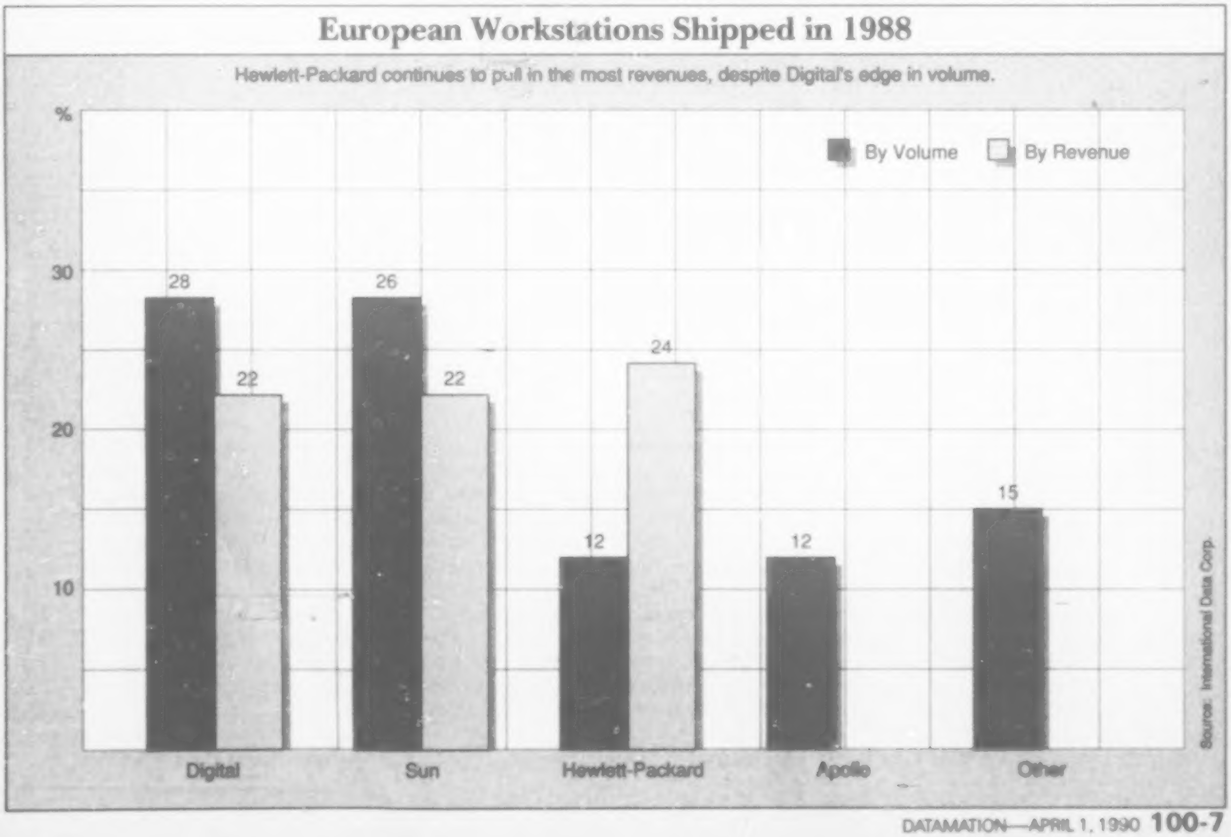
BY MARTIN HEALEY

In Europe, diversity dominates and divides the various countries and cultures. That same diversity is also discernible at the low end of the information systems spectrum, where there exists a wide range of market conditions and application needs. However, cutting through this diversity are common attitudes toward technology and its associated risks and rewards.

Overall, the European market for PCs and workstations is reasonably buoyant, with user interest picking up in both the private and public sectors. Yet, despite some nationalistic tendencies toward homegrown wares—particularly in France and West Germany—most of the PC and workstations being purchased in Europe today are of foreign vintage.

To fully understand the market, you must understand the mentality at work in Europe. While Europe is made up of discrete countries at various stages of IS implementation, these countries share many of the same attitudes regarding PCs and workstations.

Right now, most European users are saddled with DOS systems, and the software problems associated with these PCs are beginning to surface. At the same time, users are currently reluctant to bring in new machines, choosing instead to maximize their current investments.


European Workstations Shipped in 1988

Hewlett-Packard continues to pull in the most revenues, despite Digital's edge in volume.

Source: International Data Corp.

Aware of these problems, European users are demanding more from their current PC products.

This conservative trend, which is much more prevalent in Europe than in the United States, should slow the pace of European PC purchasing. This naturally runs counter to optimistic predictions that the European PC market will continue to grow at a healthy clip well beyond 1993, when many of Europe's economic borders will come down.

What will burgeon is the number of PCs connected to local area networks; however. Consequently, the revenue from LANs should actually grow more than the revenue from PCs. The demand for high-end network servers in Europe should also increase as more PC users connect their machines directly to LANs.

Multiuser Systems Turning to Unix

The most significant expansion in the PC market is expected to come from multiuser machines targeted at the lower end of various vendors' minicomputer lines. Multiuser systems based on PCs will inevitably turn to UNIX. What that means for the future of office workstations is still not certain, since the battle will be raging for some time to come over whether UNIX or IBM's OS/2 operating system will dominate desktops in Europe and the United States. Nevertheless, it is reasonable to speculate that OS/2 will be the choice of European companies in the private sector, which persist in clinging to proprietary products.

But the move to OS/2 promises to be a slow march because the operating system is still immature and the cost of the hardware remains prohibitive. As a result, OS/2 is not expected to become a major force in the European office workstation market before 1992.

☐ MULTIUSER SYSTEMS BASED ON PCs WILL INEVITABLY TURN TO UNIX.

In the public sector, meanwhile, UNIX will be favored. Influenced by political decisions and supported by the national Post, Telephone & Telegraph (PTT) authorities, European governments are making strong commitments to both UNIX and the International Standards Organization's Open Systems Interconnection (OSI) model. And, indeed, many public organizations in Europe are already specifying UNIX as the mandatory operating system.

Purchasing PCs in Europe

In Europe, middlemen are the name of the game when it comes to peddling and purchasing PCs. While mail-order marketing is used to move some machines, most are sold through a supplier/distributor/dealer hierarchy.

In the commodity corner of the market, price reigns supreme. However, things get more confusing on the business-computing front, where the systems spectrum ranges from simple PCs all the way up to multiuser 386 machines that are gradually muscling their way into minicomputer turf.

The confusion in this segment stems from the fact that typical PC dealers in Europe usually don't have the basic skills needed to sell the more sophisticated business-computing products. And the minicomputer dealers and agents who have those prerequisite skills don't want to sell these lower end wares because they're still wedded to traditional minis of the IBM System/36 breed.

Influencing every PC product segment are Europe's corporate users, who often have special arrangements with dealers for machines. Many of these private sector users have set their own rules about PC purchasing and have their preferred products. Many are moving to connect their PCs into local area networks with mainframe terminal emulation. Currently plugged into PC/DOS or Apple Computer Mac machines, this Continental corporate contingent is the camp IBM must woo to ensure the future success of OS/2 in Europe.

With the big push by the European public sector for standards, UNIX and OSI promise to spark sales of multiuser PCs and possibly even office workstations. Still, the bulk of the office workstation business in Europe will come from private sector firms because the cost per user—running roughly at $7,000 for a 7-megabyte PS/2 model 70—is far too high for public sector organizations. As a result of these cost considerations, PC/DOS machines, warts and all, will continue to remain strongly present in the public sector for the foreseeable future. And both sectors are contributing to the growth of PC/DOS-based LANs.

Similarly, with the exception of a few application areas such as geophysical research, European governments have not been heavy users of engineering workstations. The dominant users of engineering workstations in Europe have been in the private sector, where shipments have soared over the past few years.

Vendors With Appetites

In 1988, shipments of engineering workstations in Europe skyrocketed 82% to 66,000 units, according to International Data Corp. of Framingham, Mass. The current installed base in Western Europe of 2,148,000 engineering workstations is expected to continue to expand before leveling off in 1994. The real growth in the market promises to come from reduced instruction set computing (RISC) machines—growth that could hold big payoffs for the current market leaders, IBM and Silicon Graphics Computer Systems Inc.

There are no noteworthy European engineering workstations. As in the rest of the world, U.S. vendors Apollo Computer Inc., Digital Equipment Corp., Hewlett-Packard Co. and Sun Microsystems Inc. share stakes in the engineering workstation market in Europe. HP, however, is still the biggest shareholder in that market, which will continue to be dominated by U.S. suppliers.

☐ RIGHT NOW, MOST EUROPEAN USERS ARE SADDLED WITH DOS SYSTEMS.

European vendors, hungry for a slice of this juicy segment, are expected to link up with other foreign suppliers, marketing the resulting workstation wares under their own labels. Many of these deals will be with smaller companies that produce less popular RISC machines. Such collaborations could wind up giving front-runners IBM and Silicon Graphics a real run for their money in Europe.

This link-and-label approach is all too familiar to European vendors, most of which have dropped the ball at the low end and filled in their PC product gap with machines manufactured in the Far East and sold under their own proprietary names. Most are IBM-compatible machines that are chiefly sold through dealer networks.

Martin Healey is chairman of the board of Technology Concepts Ltd. in Cumbran, South Wales.

DATAMATION/PRICE WATERHOUSE QUARTERLY REPORT

Meeting Project Deadlines Is the Top Priority

IS executives are most worried about meeting time schedules and performance guarantees for key systems projects. Costs, meanwhile, seem to be under control.

BY NORM STATLAND

Cost containment no longer ranks among the chief concerns facing information systems executives, a signal that user organizations have their IS expenses under greater control than at any other time in recent years.

Instead, IS execs polled by DATAMATION and Price Waterhouse are wringing their hands over project deadlines, new technology management, maintenance and voice/data integration.

In voicing such concerns, IS executives are saying that:

- Computer-aided software engineering tools and systems development methodologies haven't made significant inroads into the problem of delivering systems development projects on time.
- Suppliers of new information technology and industry experts/consultants must do a better job helping users predict what impact new developments will have on their organization's key processes, and they must do that with enough lead time to allow users to deal effectively with the new technologies.
- Requests from end users and business unit managers to enhance existing applications and build new ones are stretching the limits of IS executives' ability to maintain systems. The reasons for the delays are tied into the architecture of most systems that were created in the 1970s and early 1980s. These were fragmented rather than integrated designs, developed without the driving factor of a data model.
- The integration of communications and information processing is a necessity as more and more organizations begin to rely on networks to knit together far-flung business-processing activities. The need is most pressing in large organizations, ones employing 500 or more workers. More than half plan to let end users increase spending on distributed computing, which usually entails substantial outlays for local area networks.

One reason, perhaps, that so many IS executives are focusing on these problems instead of on budget issues is that a number of them have put the brakes on spending. Our poll indicates that as many as three out of five users will hold the line in all areas of spending and staff increases for the immediate future.

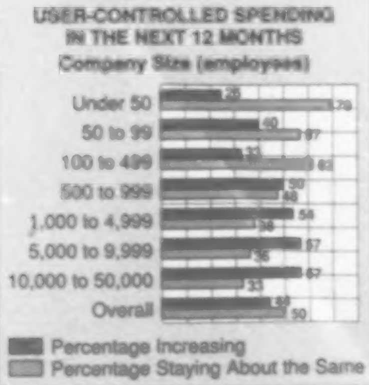
The shift away from cost concerns to more pressing needs like integration reflects, perhaps, a growing awareness of the importance of strategic systems planning. Properly drawn plans should strive to provide for a database or databases that can be shared throughout an enterprise—a feat that will require more attention to data-driven designs.

Building systems driven by a data model will enable IS executives to create far more flexible systems than they could otherwise. And flexibility, as we all know, will be a hallmark of the successful corporation of the 1990s.

Norm Statland is national director of Price Waterhouse's Information Technology practice.

Distributed Computing Outlays Are Up at Large Companies...

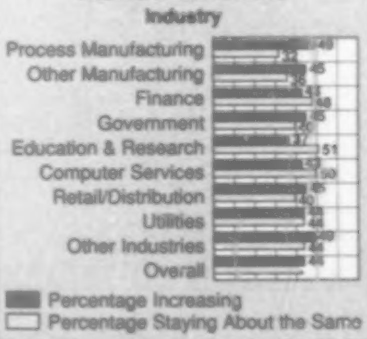
Although most IS execs are holding the line on spending, they aren't sparing dollars that end users can spend on PCs and networks.



Source: DATAMATION/Price Waterhouse

While Hardware Investments Are Even...

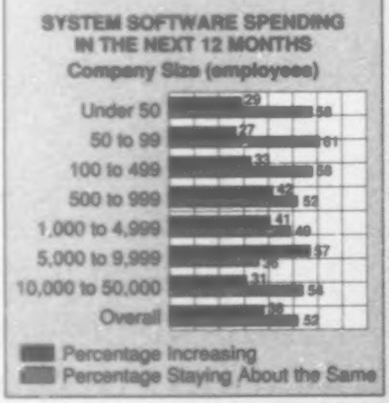
The number of IS execs who are buying more CPUs is nearly the same as those who are content with their current systems.



Source: DATAMATION/Price Waterhouse

And Software Spending Dips

Barely one out of three IS execs is plunking down more money for software.



Source: DATAMATION/Price Waterhouse

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SPECIAL REPORT: Microsoft in the Age of Networks

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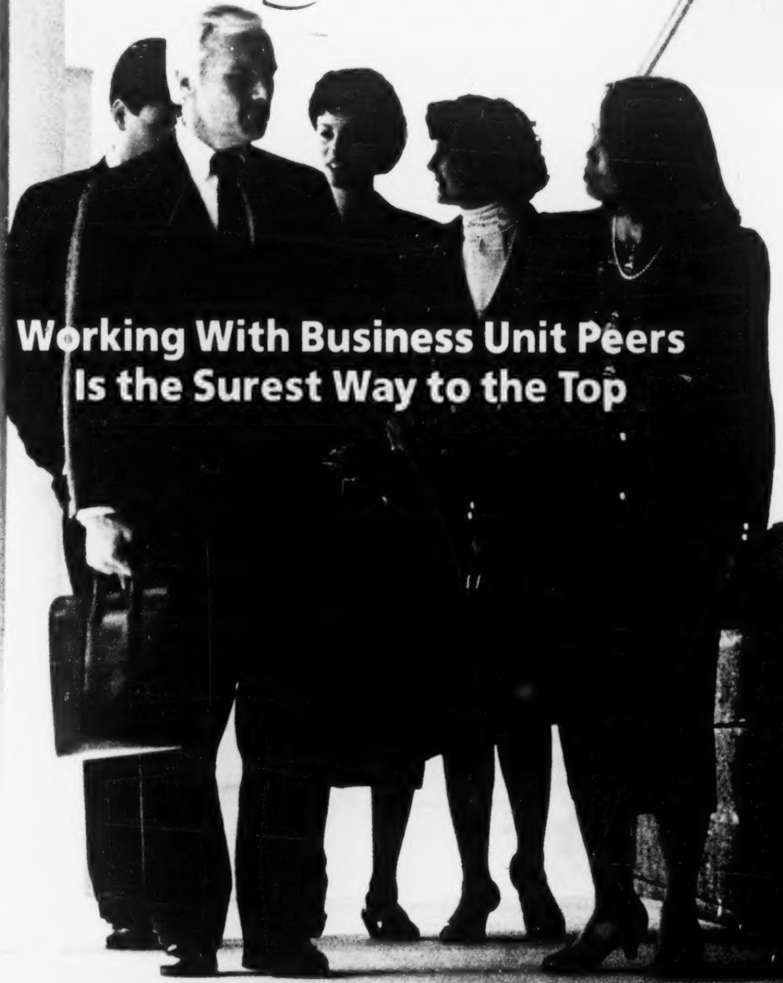
Why You Should Be Making IS Allies



Working With Business Unit Peers Is the Surest Way to the Top

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Where Open Systems Are Making Headway

Has the Mini Met Its M

MAY 1, 1990

VOLUME 36
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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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Why You Should Be Making IS Allies 26

BY JEFF MOAD Frustrated with trying to penetrate the executive suite and with pitching competitive advantage, IS executives are now pushing for partnerships with line managers to improve internal business processes. But will this new role pay off?

Cover photography by Superstock Inc.

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Microsoft in the Age of Networks 36

BY JOHN McMULLEN Ever since the IBM PC and compatibles industry started, Microsoft has been the leader in software. But as companies begin to hook their micros into networks, will Microsoft be able to maintain its preeminence?

Bill Gates, Microsoft's chairman and CEO, says the company is ready to meet the network challenge.

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What's happening right now is that everyone is beginning to move toward symmetric multiprocessing, putting lots of processors into a single box.

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Open Software Foundation
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We have a policy of decentralization and distribution, with coordination at the center.

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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

OSF president Tory talked candidly about issues surrounding the UNIX wars.

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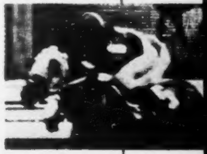

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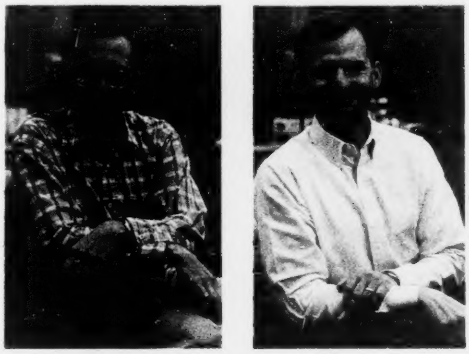
INSIDE DATAMATION

The Value of Peer-to-Peer Networking

Where does one find most top managers of information systems these days? If one used companies' annual reports as a guide, a couple of conclusions could be drawn—one correct for the time being, the other misleading.

It would be fair to say that most IS executives are not regarded as one of the top two or three guns at their enterprises. Few, if any, serve on their companies' boards of directors. A minority bear that exalted title of chief information officer—a moniker meant to bring its owner into the inner circle of chief executive, operating and financial officers.

It would be wrong, however, to assume that IS executives are just headquarters hermits, closeted with other officers of centralized functions and focused solely on managing their IS staffs. In fact, many are spending greater amounts of their time out of the office, teaming up with their peers—division presidents, etc.—to apply information technology in ways that will lift their organizations to new heights. IS executives have determined that such altitudes, if reached, will go a lot further than fancy titles in bringing them closer to the inner sanctum of management at their corporations.



Photographs by David Bradley

MOAD (left) AND McMULLEN teamed up on communications issues.

Locating the locus of power for IS brass challenged senior writer Jeff Moad, who prepared this issue's cover story, "Team Leader: A Bold New Image for IS Execs." His assignment began as an investigation into how the best IS managers in the world are able to communicate the value of their activities to CEOs. Past encounters with enlightened IS chiefs had persuaded us that they possessed unique presentation and marketing skills enabling them to sell technology solutions to the top brass. The more Moad probed the issue, however, the more he found executives spending their time communicating with peers—not creating slide shows for boardroom reviews.

Microsoft's Future in Networking

Another member of the DATAMATION team faced a challenge equally as daunting as Moad's in this issue. Associate editor John McMullen drew our third strategic supplier profile assignment for 1990—the first two being our special reports on IBM in January and Digital Equipment Corp. in March. Although his target, $1 billion Microsoft Corp., isn't nearly as large as Big Blue or Digital, changes occurring at the desktop software leader gave McMullen plenty to assess. He came away from Microsoft with a look not only at where MS-DOS and Excel's creator is today but where chairman William Gates is leading his teams of programmers in the future in "Microsoft in the Age of Networks," page 36.

Tim Mead

Tim Mead, Editor-in-Chief

DATAMATION

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A New LAN Standard Lights the Way

FDDI, a new standard for fiber optic networks, is ready to illuminate the LAN landscape. While most network managers eagerly await a flood of new products, naysayers fear that FDDI is already out of date.

BY STEPHEN A. CASWELL

From the basic description, you'd think FDDI was a Cecil B. deMille movie: seven years in the making, anxiously awaited by thousands and coming soon to a stage near you. Although it's not likely to create the same stir as *The Ten Commandments* or be *The Greatest Show on Earth*, FDDI—the Fiber Distributed Data Interface standard—certainly will add drama to a market long starved for a high-speed local area network communications standard.

FDDI was designed within the American National Standards Institute (ANSI) Committee X3T9.5 by several dozen participating computer and telecommunications companies. This alone makes FDDI special because it's the first mainstream local area network (LAN) standard that was developed by the industry as a whole. In contrast, other ANSI LAN standards, such as Ethernet (802.3) and Token Ring (802.5) were developed by vendors and adopted as standards by ANSI because of their widespread implementation in the field.

FDDI products are barely out of the box, and already the standard has the support of more than 80 leading telecommunications and computer companies worldwide. Furthermore, say analysts, the FDDI standard has strong user appeal. In order for a proprietary LAN solution to beat out FDDI, there will have to be a compelling reason.

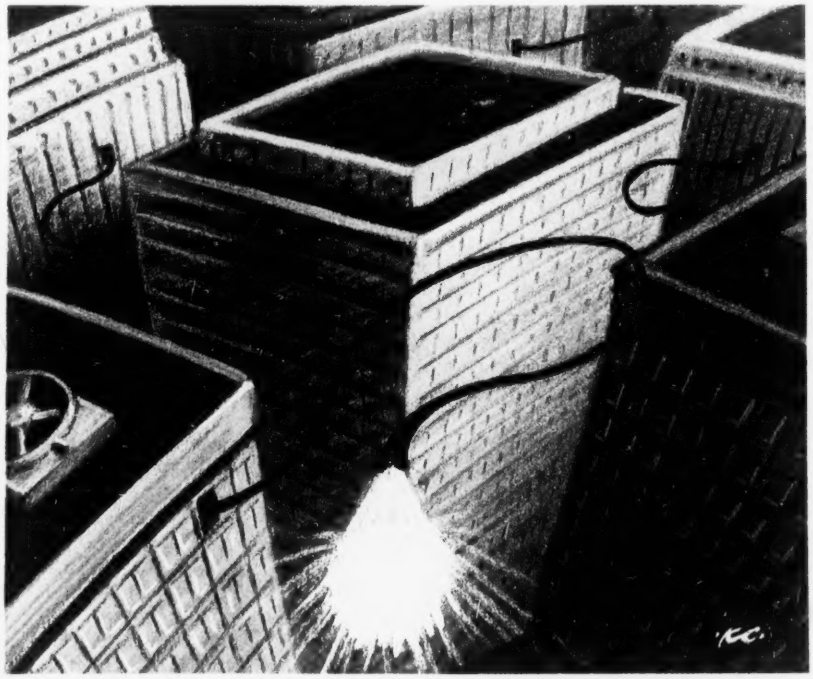


Illustration by Ken Condon

Yet a few nagging questions remain, particularly concerning the role FDDI will play in most organizations and the length of time it will last in the marketplace. FDDI, after all, has already taken a long time to reach users. Is it already outdated or does it have a big role to play—and where?

FDDI Basics

FDDI uses a token-passing access scheme on optical fiber media to achieve a speed of 100 megabits per second (Mbps), which is an order of magnitude faster than Ethernet's speed of 10Mbps. FDDI also has network station management capabilities baked right into the protocol, which is viewed as a critical benefit to companies that function in a multivendor environment.

The FDDI standard itself has four components: Physical (PHY), which describes the physical connectors and cables; Physical Media Dependent (PMD), which describes the link protocol; Media Access Control (MAC), which describes the peer-to-peer protocol between nodes; and Station Management (SMT), which is the network management component.

The PHY, PMD and MAC specifications are already complete. The SMT component is in draft form and is expected to be completed by early 1991. Vendors, however, already have products on the market that they say adhere to the SMT draft specification and will be upgraded to the final specification. Synernetics Inc., an FDDI supplier in Billerica, Mass., recently announced formation of the SMT Development Forum to encourage a uniform implementation of the SMT specification.

When added together, the four components of FDDI map into the first two layers of the seven-layer Open Systems Interconnection Reference Model, although many people say that the MAC component has some of the intelligence that is normally associated with OSI's third layer.

With OSI support behind it, FDDI seems poised for ready market acceptance. "FDDI is a great deal for end users and the component manufacturers," says Kenneth Bosomworth, president of International Resource Development Inc., a market research firm in New Caanan, Conn. Yet LAN vendors' success at capitalizing on FDDI remains uncertain. According to Bosomworth, FDDI will create a "dog eat dog market based on price" for LAN vendors because most of the value will be supplied by chip and optoelectronics suppliers. This leaves little room for LAN suppliers to differentiate their products.

The Building Momentum

Although relatively few end-user products have been shipped, momentum for the FDDI market is starting to build rapidly. Advanced Micro Devices Inc. of Sunnyvale, Calif., which so far has developed the only FDDI chip set on the market, is leading the charge. In July 1989, AMD established the Advanced Networking Group among LAN developers and vendors.

The purpose of the group, says John Jaeger, product marketing manager for AMD's FDDI Supernet chip set, is to promote FDDI in the marketplace and to help vendors establish interoperability among different products, so that LAN nodes from a variety of vendors will all work together in a single installation.

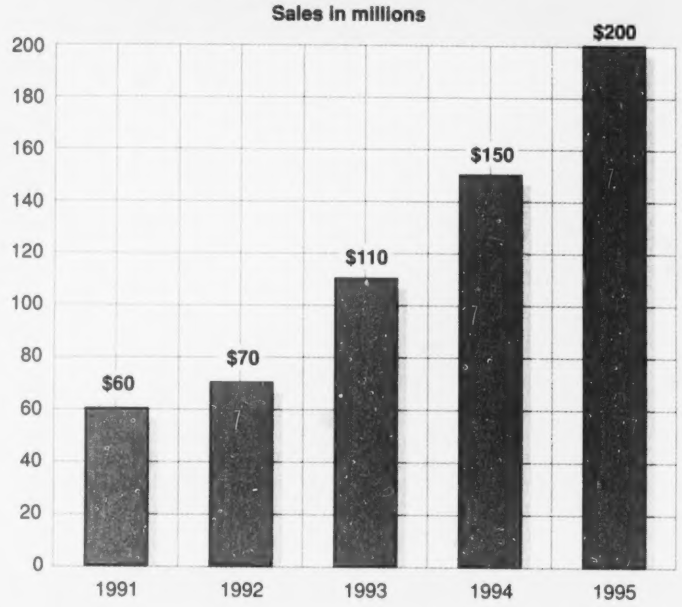
> ☐ FDDI IS SEEN AS THE COMING STANDARD FOR CORPORATE LAN BACKBONES.

According to Jaeger, there are now about 80 members of the Advanced Networking Group. The list reads like a Who's Who of the computer networking and telecommunications industry and includes giants such as AT&T, Hewlett-Packard Co., Sun Microsystems Inc., Sony Corp. of America, Toshiba America Inc., Unisys Corp. and Wang Laboratories Inc., along with several dozen LAN vendors and component suppliers.

Conspicuously missing from the list are Digital Equipment Corp. and IBM, although not being on the list does not necessarily signal a lack of company support for FDDI. Digital, for example, has already announced an FDDI product and has developed very large scale integrated circuits (VLSICs) for FDDI that it licensed AMD to manufacture for the general market. William Johnson, Digital's vice president of Distributed Systems, furthermore, has announced his firm's public support for FDDI.

The Growing Demand for Fiber

Demand for FDDI subsystems will grow quickly over the next five years. But sales should peak in 1995 and decline thereafter.



Source: International Resource Development

IBM has made no announcements and doesn't comment on unannounced products. Yet Big Blue has publicly signed deals with Cisco Systems Inc. of Menlo Park, Calif.; Communication Machinery Corp. of Santa Barbara, Calif.; FiberCom Inc. of Roanoke, Va.; and Wellfleet Communications Inc. of Bedford, Mass. Each of these companies is expected to play an important role in the FDDI marketplace. Furthermore, IBM has said it is looking at FDDI and other high-speed LANs in its research laboratories in Raleigh, N.C., and Zurich, Switzerland.

Leader of the Pack

Although a number of vendors have announced new FDDI products and several are shipping products now, the acknowledged leader of the pack today is Hyannis, Mass.-based Fibronics International Inc., which can lay claim to 80 to 90% of the current installed base.

A Fibronics spokesman says the firm has 900 FDDI nodes installed in 70 companies worldwide. Installations include Argonne National Laboratory, Coors Brewing Co., General Motors Corp., Italian Autostrade, Martin Marietta Corp., Mitsubishi International, NASA Langley Research Center and TRW Inc.

Italian Autostrade, the government agency in charge of Italy's national highway system, has an application that shows the potential value of FDDI's increased speed of 100Mbps—automated toll booths that can capture billing data while cars pass by at about 30 miles per hour.

FDDI Takes Its Toll

The toll booths are connected via an FDDI backbone LAN directly to a mainframe computer. Drivers install a small box on the car's visor that sends credit card data via radio signals to the toll booth as the car passes by. The data are then posted to a central database at high speed. FDDI was required, according to a Fibronics spokesman, so that the mainframe doesn't miss a transaction.

Although Italian Autostrade's may be an exotic application, FDDI's bread and butter installations will be far more mundane. FDDI is viewed by virtually everyone in the market as the coming standard for corporate LAN backbones.

The National Aeronautics and Space Administration (NASA) Langley Research Center, a research and development arm of the government space organization based in Hampton, Va., is an example of how FDDI is likely to operate as a backbone. Ed Riddle, the head of the Communications and Network Systems Branch at NASA Langley, says he is pleased with FDDI technology. "We feel very good about its future."

☐ **AN END USER COULD INADVERTENTLY END UP LOCKED INTO ONE SUPPLIER.**

NASA Langley is a campus environment that comprises 100 buildings on four square miles. In 1985, says Riddle, 50 Ethernet LANs were installed and were interconnected via a 10Mbps Pronet 10 backbone network from Proteon Inc. of Westborough, Mass.

As the Pronet 10 backbone became saturated with traffic and required updating, Riddle says he compared a nonstandard solution—the newer 80Mbps Pronet 80 from Proteon—with the FX8210 FDDI LAN from Fibronics. Riddle's firm then purchased a Fibronics backbone to link two Ethernet LANs in NASA Langley's test lab and followed this with another FDDI backbone purchase to connect two more Ethernet LANs in a working field trial.

"We were surprised at how well it works," says Riddle. "[FDDI] is ideal for a backbone to interface our different Ethernet LANs." The fact that FDDI was a standard solution was "highly significant," Riddle says, because it gave him hardware flexibility. However, he is still waiting for Fibronics to develop some additional network management software that will further enhance the backbone.

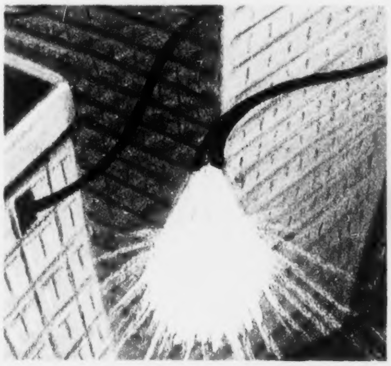
Network Management Is Key

The unique architecture of LANs provides special advantages for passive network management at a modest price. On most LANs, data pass by every station. By simply putting software on any computer on the LAN, traffic can be passively monitored as it passes by.

When a backbone LAN is installed, network monitoring can be extended across every individual network on the system. (Individual networks are referred to as either "subnetworks" or "front-end" networks.) This is accomplished by putting monitoring software in the bridge between the subnetwork and the backbone.

Because the bridge is connected on one side to the subnetwork and on the other side to the backbone, it can monitor activity on the subnetwork and pass the information to a single network management station residing on the backbone itself or on any subnetwork within the overall network. Monitoring each subnetwork in this fashion makes it easier to expand the capacity of subnetworks and the backbone gracefully.

Right now, Riddle is waiting for Fibronics to deliver the ability to monitor traffic on his subnetwork Ethernet LANs before he commits to installing FDDI as the backbone for all NASA Langley's Ethernet LANs.



Riddle's experience at the NASA Langley installation gets to the heart of an important issue: How far does the FDDI standard reach? In theory, FDDI's station management capabilities allow active network management. This means that it is possible to track network use and query the status of every FDDI node on the network, which is important in determining the location of specific faults. But SMT does not readily extend itself to other LANs, such as AppleTalk, Ethernet or Token Ring. In essence, users will still require a proprietary network management scheme, such as the pending Fibronics solution, to track the status of all subnetwork LANs.

A Potential Glitch

This seemingly tiny hole in the FDDI standard adds a potential glitch to its value as a standard for corporate backbones. By using custom software from an FDDI vendor to provide any important feature, an end user could inadvertently end up locked to that one supplier.

Riddle say that, although the issue of monitoring his subnetworks is important, this current FDDI shortcoming is not enough to keep him from using the new standard. "I don't want to accidentally negate the value of the standard and also don't want to get locked into a single vendor," he says. "We'll have to hope that we get standard NMS [network management system] software as the market develops."

A standard solution may not be too far off. "Once FDDI gets going as a corporate backbone," says Information Resource Development's Bosomworth, "enterprising people will figure out how to extend its management capabilities. Over the short term, we'll probably see third-party software that extends SMT into Ethernet and other LANs. Over the long term, we may see SMT become a part of both Ethernet and Token Ring, as well."

On the Front Lines

Although most analysts expect FDDI to become the standard for LAN backbones, there is considerable controversy about another role that FDDI is expected to play—linking high-speed graphics workstations and minicomputers or mainframes directly together at 100Mbps.

The leading workstation companies—including Apollo Computer Inc., Digital, Hewlett-Packard and Sun Microsystems—are expected to ship FDDI products this year. We can also assume that FDDI is in the cards for IBM's hot new workstation, the RISC System/6000.

The problem is that a number of observers don't believe FDDI has enough horsepower to meet all the demands of graphics workstations. According to Frank Dzubeck, president of Communications Network Architects Inc. a consulting firm in Washington, D.C., FDDI cannot adequately service high-end workstations that process rotating 3-D graphics. To do this properly, Dzubeck claims, a minimum of 148Mbps bandwidth is required; otherwise workstation performance degrades.

☐ **THERE ARE SERIOUS QUESTIONS REGARDING HOW FAR FDDI WILL BE ABLE TO GO.**

Tim Kuhfuss, an assistant computer scientist at Argonne National Laboratory in Argonne, Ill., agrees. Kuhfuss, who is testing FDDI, says, "A number of our researchers have said they'll need something like a gigabit for applications such as scientific visualization of images."

Still, Dzubeck and Kuhfuss also agree that, while FDDI won't meet every need, it will certainly address the needs of many users. Dzubeck expects to see higher speed proprietary LANs that will meet the limited demand not met by FDDI. These higher speed LANs, he says, will be linked to an FDDI backbone and will simply slow down when graphics have to be transferred across the backbone.

Watch Your Wallet

Although most problems people seem to have with FDDI lie at its periphery, one problem cuts to the core: price. Today, a typical FDDI node sits in the $10,000 range, which is pricey even for a backbone. Fortunately, everyone expects the price to drop rapidly when new products flood the market later this year.

John Jaeger from AMD expects the price of backbone connections to fall at least to the $4,000-to-$6,000 range within a year, and possibly down to the $3,000-to-$4,000 range. By 1993, Jaeger expects that connections will be priced in the $2,000-to-$3,000 range and by 1995 will be under $1,000.

"The price makes a big difference," says Kuhfuss, although he couldn't say precisely what price would justify FDDI because different applications have different cost justifications. But, he says, once FDDI reaches below $3,000 for an interconnection to a backbone or to a workstation the standard will become "very attractive."

☐ EVERYONE EXPECTS THE PRICE TO DROP RAPIDLY LATER THIS YEAR.

The bottom line on FDDI is that after seven years of development by committee, this is the first year in which FDDI will become an operating reality. Despite a major push from vendors, there are serious question regarding how far FDDI will be able to go in the marketplace.

How far and for how long FDDI will meet the needs for graphics workstations is a big question that cannot be answered until products reach consumers. It's even more uncertain whether business users will replace their front-end Ethernet, ARCnet and AppleTalk LANs with FDDI. To do so will require not only pulling fiber to every desktop but also making a substantial investment in every workstation in the form of new interface boards. For these reasons alone, FDDI may never advance much beyond being a backbone.

So FDDI is not going to be everything to everybody. "FDDI does not excite us," maintains John Leong, networking director at Carnegie Mellon University in Pittsburgh. "An order of magnitude increase from 10Mbps to 100Mbps at this point in time is just not exciting." But with dozens of companies readying products for something that has the ANSI seal of approval, it's a safe bet that FDDI is going to play a huge role in the future of corporate LAN backbones and a significant one for front-end LANs that need more oomph than Ethernet. ▭

Stephen A. Caswell has more than 15 years' experience writing about data communications. He is based in Westlake Village, Calif.

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A Proprietary Faith For Midrange Users

With some exceptions, mainly at the low end, most European users of midrange systems continue to follow their existing suppliers' proprietary operating systems doctrine.

BY JAMES ETHERIDGE

With most midrange hardware and software in Europe running proprietary operating systems, users are remaining largely faithful to their regular vendors. Nonproprietary alternatives, such as UNIX, are making converts largely at the low end of the midrange system market.

The main vendors competing for the general-purpose midrange systems market in Europe include two major indigenous players (led by Siemens AG and Groupe Bull) and three U.S. giants (Digital Equipment Corp., Hewlett-Packard Co. and IBM). These vendors and dozens of other, smaller suppliers should find the competition heating up if midrange systems sales slow to the expected snail's pace and the proportion of information technology budgets devoted to these systems falls sharply.

Midrange systems accounted for only 18.5% of total European information technology spending in 1988, according to International Data Corp. The Framingham, Mass., market research firm defines midrange systems as those selling for between $100,000 and $1 million. A similar proportion of European IS dollars (18%) was spent on small systems, according to IDC (those costing between $10,000 to $100,000), 20% on mainframes and a whopping 43.5% on micros. Valued at $7.5 billion in 1988, total European sales of midrange systems accounted for 35% of the $21.5 billion worldwide market, according to IDC's numbers.

Sizing Up the Market

Indeed, the midrange systems market in Europe, like that for mainframes, is basically a renewal market now, says Guillaume Tostain, research manager at IDC France. IDC France predicts that sales of midrange systems will increase at a sluggish 2% annual rate between now and 1993. Hence, the midrange segment's market share is forecast by IDC to fall to 13% by 1993, with the mainframe share similarly dropping to 14%, small systems edging up to 19% and micros soaring to 54%.

Midrange systems cannot even be sure of preserving their identity since "they are being challenged by small systems and top-of-the-range micros," says Tostain. "Niche players like Tandem have a brighter future than most. . . . Some midrange vendors will disappear."

Of the vendors leading the pack today, IBM, of course, dominates with a 31% share in 1988, followed by Digital (13.9%), Siemens (8.3%), Bull (7.9%) and HP (6.7%), according to IDC. Fully 58 other vendors are vying for the other 32.2% of the market led by Tandem Computer Inc., Unisys Corp. and Wang Laboratories Inc.

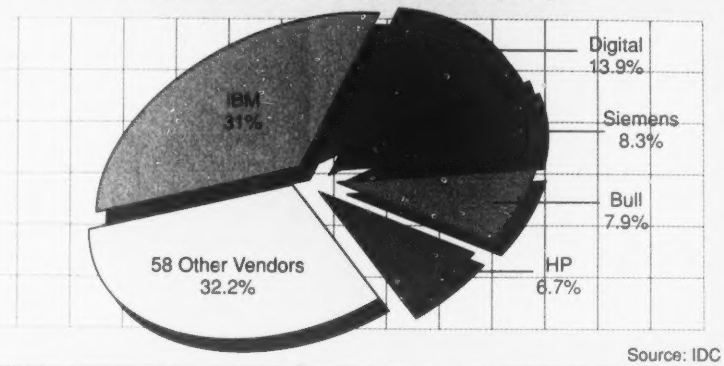
IDC's Tostain says IBM will probably cling to its dominant position, especially as the AS/400 is selling so well. The popular midrange system's success may be due largely to IBM's adherence to its proprietary faith rather than heeding the call of the vociferous UNIX congregation. "The strategy of IBM and others has been to put the emphasis on [proprietary] software by concluding contracts with developers," Tostain points out. In doing that, he adds dryly, "IBM was able to get away with launching a major new mini running on a new operating system that is not UNIX." The AS/400 launch was also

BP ENGINEERING'S BYLETT: His group stayed with VAX for its inhouse accounting system, as it provided automatic backup for the system's hardware.

Europe's Biggest Keepers of the Faith

In 1988, IBM dominated the market for general-purpose midrange systems, define as those priced between $100,000 and $1 million.

MIDRANGE SYSTEM MARKET SHARE (1988)



Source: IDC

aided by the good migration path IBM built from the System/38, Tostain explains.

The proprietary AS/400 attracted the big Paris-based industrial conglomerate, PÄchiney SA, despite the fact that the company took a different migration path, moving from the System/36. Posting revenues of Fr89 billion ($13.9 billion) in 1989, this diversified multinational, whose activities cover aluminum smelting, nuclear power, packaging and electrometallurgy, has a highly decentralized corporate ethos. Its 250 manufacturing and commercial units around the world have considerable operational autonomy, although many sites are not very large.

Reducing Suppliers and Costs

That corporate style is reflected in the conglomerate's midrange IT strategy, which distributes the data-processing burden among a multitude of midrange systems at the local level rather than concentrating it in a central site. "We have a policy of decentralization and distribution, with coordination at the center," explains Pierre Dubarry, group general manager of information systems. "That way, we can keep the number of suppliers down and reduce our costs by centralizing purchases from our three main suppliers for the whole group."

The Big Three suppliers for PÄchiney are IBM, Digital and HP, which account for 65%, 25% and a little under 10%, respectively, of the company's administrative systems. When it comes to industrial systems, however, 65% are Digital and 30% HP.

PÄchiney operates an international network, managed at the central site by an IBM 4381, to which the remote sites are connected through workstations and micros for data transfer to and from the central site. Databases are essentially decentralized, using native database management systems supplied by the hardware vendors. Software development is kept to a minimum: "We have a packaged software approach where possible, especially for general administrative applications," says Dubarry.

Dubarry has no complaints about proprietary operating systems per se. Most companies in the conglomerate use just one supplier, so there aren't any multivendor environments at individual sites requiring different makes of hardware to communicate with each other. As far as Dubarry is concerned, the group has made firm choices of suppliers for the foreseeable future, and he doesn't feel any desire or need to diversify hardware or introduce a unified operating system for greater applications portability. "Our big challenge over the next three years is how to interconnect our midrange systems with the micro networks that are beginning to be installed," he says.

A company like PÄchiney that has grown partly by acquisition is bound to have inherited a mix of systems along the way. The company's current more limited choice of vendors was the result of a rationalization process. Some years ago, PÄchiney had some small mainframes from Bull, but dissatisfaction with the French computer maker's hardware during its difficult renaissance in the early 1980s caused PÄchiney to eliminate all Bull systems. Although Bull is now a more credible and reliable supplier of systems that correspond to PÄchiney's requirements, Dubarry has no intention of going back on his decision, implying that Bull has missed the boat and that the group is committed to its chosen vendors over the medium term—the next one to three years.

> ☐ **THE STRATEGY OF IBM AND OTHERS HAS BEEN TO PUT THE EMPHASIS ON SOFTWARE.**

The Devil They Know

Most companies naturally favor the devil they know over the devil they don't when it comes to choosing a new system. In fact, for users like Dubarry and Brian Bylett, chief accountant at BP Engineering, a London-based subsidiary of BP International Ltd., proprietary midrange operating systems are anything but a constraint. As IDC's Tostain points out, they "already have many applications up and running, and they are developing new ones that are compatible with existing applications since they run on the same operating system."

BP Engineering, which provides engineering services of all kinds to its parent, chose to run its new accounting software on a Digital system because the company's engineering operations were already VAX-based. Until recently, the company's accounting was handled by BP International's central accounting department, which used the IBM-based Millennium accounting software from McCormack & Dodge Corp. In 1985, BP Engineering decided to set up an in-house system. As Bylett explains, the group decided to stay with VAX so automatic backup would be available should the accounting system's hardware go down.

"The VAX hardware still left us with a reasonable choice," maintains Bylett. Having looked at three packages—the Integrated Accounting System from Coda Ltd. of Leeds, U.K.; another package from the Dublin-based G.C. McKeown; and McCormack & Dodge's GLPlus—Bylett quickly opted for Coda's system. It was originally developed to run on HP hardware, but was subsequently redeveloped for the VAX and is being adapted for IBM systems.

"What swung it was the way it's arranged, as software within software," says Bylett. "It uses ISLink to enable Coda to be integrated with your existing software, so there is a good interrelationship. And you can simply install upgraded versions without any problem. Secondly, it struck us as being a system conceived by accountants for accountants and not by systems analysts for systems analysts. . . . And, in general, it is user friendly, and people can be easily trained to use it."

Four people spent nine months developing the new accounting system in 1986, and it went live in 1987. A VAX

8200 was acquired to run it originally, but it has since been upgraded to a dual-processor 8350 to which 35 terminals are connected and which also handles batch processing. Bylett's only complaint has to do with data access. "It has to go through certain routes, and we would like more efficient access to data." But help could be on the way. "A relational database version of Coda's system will be available soon, which could be interesting." He wasn't aware that one was in the pipeline when he made his original choice.

Where UNIX Fits In

UNIX, the potential alternative to the proprietary route, "hasn't really taken off in this market," says IDC's Tostain. "DEC and others are coming 'round to UNIX now, but that's still not enough to replace systems using VMS and other proprietary operating systems," he says. UNIX has only eaten into the bottom end of midrange systems: "The low-end AS/400s, in particular, have lost out vis-à-vis UNIX systems."

Most vendors, Tostain asserts, have only made tentative steps towards UNIX, and predominantly at the small-systems level. "Bull gives users the chance to replace small systems by UNIX, but not midrange systems."

Indeed, Bull has been busy lately expanding its GCOS 7 operating system to give users even fewer reasons to opt for an alternative such as UNIX. Not only has Bull launched an improved top-end model, "the most powerful system ever developed in Europe," as the company modestly puts it, but it has also added a lower entry-level model, giving smaller sites access to GCOS 7.

Among the exceptions to the proprietary trend are HP and Siemens. In struggling to take market share away from IBM, HP has embraced UNIX, especially for its new systems based on reduced instruction set computing (RISC), even though it thinks its proprietary system, MPE-XL, gives up to 50% better performance. In pushing both UNIX and MPE, HP believes it is backing two sure-fire winners because, as HP vice president William Roelandt says, MPE will become the standard for transactional processing.

Siemens, too, is providing midrange users with the UNIX option. At Datenzentrale Schleswig-Holstein, a computing center providing services to the public administration of the Schleswig-Holstein region in West Germany, the head of planning and organization, Hartmut Niesing, is converting the operating system on his entire stock of Siemens BS 2000 minis. The minis, most of which still run the vendor's own Amboss operating system, will be converted to Siemens' XENIX 500 over the next five years.

The center has pursued a highly decentralized strategy over the past 15 years, downloading computing power to the individual public service administrations (hospitals, police force, passport administration, car registration, etc.) in the region. The central site, equipped with IBM 3084 and Siemens DS 2000 mainframes, has expanded over the period to manage the big centralized database, the electronic mail system (both among various remote sites and between the remote and central sites) and on-line applications.

☐ **FOR MANY USERS, A PROPRIETARY OS IS ANYTHING BUT A CONSTRAINT.**

But the big increase in power has taken place at user sites. Some 200 Siemens BS 2000 minis, models C30 and C40, are scattered around, each connected to between 10 and 100 terminals and "loosely coupled to the central hosts, in particular for data transfer at night," says Niesing. The purpose, Niesing says, is to provide good response time and good availability, which he views as the great merits of a decentralized structure. "It's a question of motivation for end users. They like to have processing power in their own hands," he says. Still, the Datenzentrale plays a strong coordinating role in selecting the main hardware to be used locally and developing applications for users. "We develop most applications ourselves, as public administration has very specific hardware requirements."

One of the reasons for going over to UNIX, Niesing says, is to take advantage of some standard applications in the market for office automation spreadsheets and word processing. The main reason, though, is greater independence from the vendor. "We couldn't change hardware or mix systems before. We were locked into Siemens."

The center is converting to UNIX over a seven-year period, with all Amboss applications being gradually converted to XENIX 500. The shift will entail an upgrade in hardware-processing capacity, enabling more terminals to be connected to distributed systems and more applications to be downloaded to the larger user base. It should go hand in hand with particularly strong growth in office automation applications.

PÄchiney's Dubarry is not convinced, though. "We are keeping an eye on UNIX, but it is not at all generalized at the moment, and no extension is planned in the immediate future. There isn't as much packaged software available as we would like. But in the future it could be a means of breaking down barriers within companies." ▭

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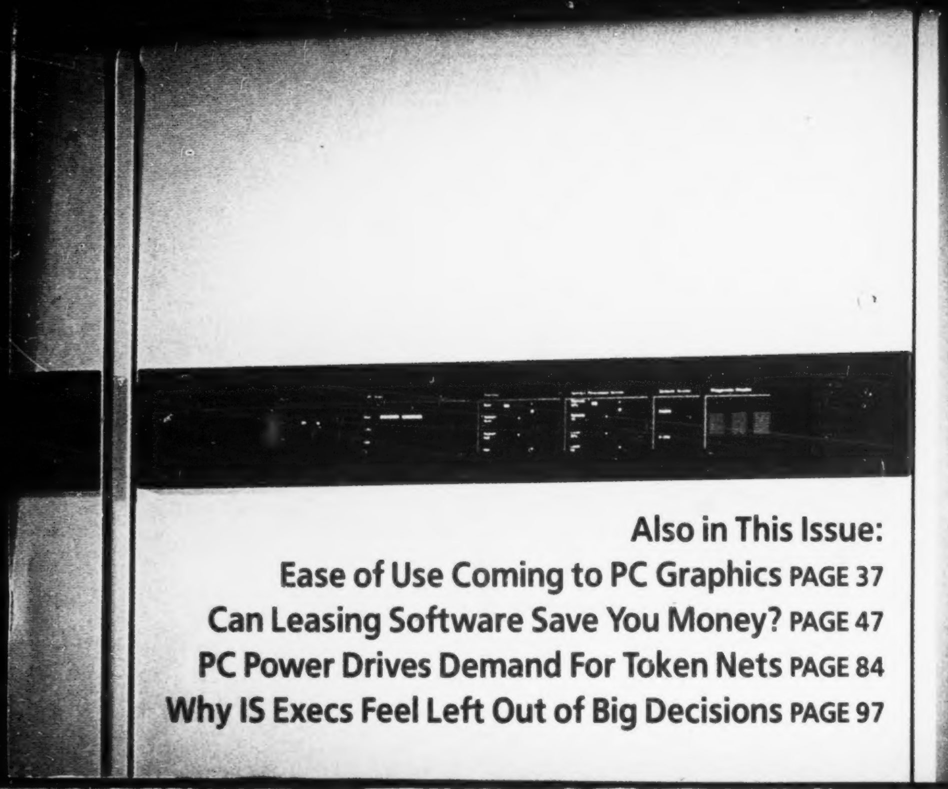
DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

EXCLUSIVE ANNUAL INDUSTRY SURVEY

LARGE SYSTEMS ARE HOT!

Networked Computing Drives Demand for More Mainframes PAGE 24



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MAY 15, 1990

VOLUME 36
NUMBER 10

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

COVER STORY

90 RESEARCH
LARGE SCALE SYSTEMS SURVEY

The corporate mainframe system takes the spotlight once again.

Large Systems Are Hot! 24

BY JEFF MOAD The latest DATAMATION/Cowen & Co. survey reveals that demand for IBM and compatible large-scale systems is rallying, as average system prices soar and new applications continue to find a home on increasingly network-oriented Big Iron.

Cover photography by Ed Braverman

INSIGHTS ON DISTRIBUTED COMPUTING

While we in the computer industry are dazzling one another with spectacular color images . . . most of the world doesn't even realize this technology exists.

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CADventures
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The standards have been sort of fuzzy, and it's only when the standards become really solid that you will see a lot of innovation.

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Once you get it [the information requested], what does it all mean? Generally, we have a very poor understanding of the vast majority of data today.

Stuart E. Madnick
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The Source of the Heat in Large Systems

Most thinking people in the industry would agree that different sized computer systems have different roles to play in corporations. Large-scale mainframe systems in big companies are the keepers of the corporate databases. Midrange computers help run the divisions and departments of many companies, but in some smaller firms actually serve as the corporate hosts. PCs and workstations, which initially empowered individuals, are now also playing larger corporate roles, many times in concert with their larger-scale brethren.

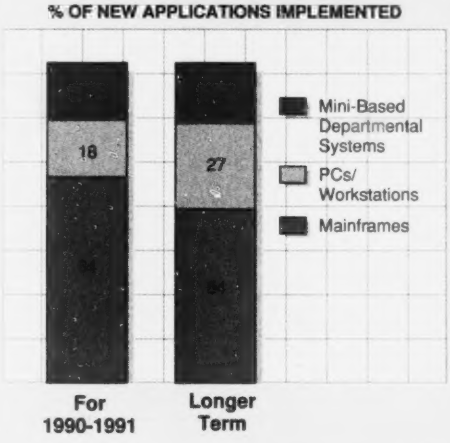
The point is that even though the lines between different types of computer systems are sometimes fuzzy, there is no one world out there. Computing will never be characterized by just one size or type of system, either mainframe or PC or, for that matter, either proprietary or open system. Our deepest apologies to zealots in the mainframe world and the PC world. It just ain't reality folks.

But even though different types and sizes of systems will persist and coexist, they will do so in a different way than they have in the past. As our latest DATAMATION/Cowen & Co. survey of computer sites throughout the United States and Canada shows, tangible evidence is building that the much talked about era of networked computing is dawning.

Our cover story on the survey, written by San Francisco bureau manager Jeff Moad, reports what you have told us—that the role of Big Iron is transforming into a very large server of information-processing services in expanding networks of personal computers, workstations and minicomputers. As a result, the unit demand for more IBM and compatible mainframe systems is up, although modestly, from a year ago. More important, though, is that the size and value of planned large multiprocessor installations is up considerably. For the first time since 1986, the average price that IBM 3090 users expect to pay for systems is up, climbing 36% to $4.2 million per system.

Where New Applications Are Going

PCs and workstations are picking up in companies with $50 million or more in revenue, but even in the longer term, mainframes still lead.



Source: DATAMATION/Cowen & Co.

But the clincher is at the applications level. Survey respondents from companies with $50 million or more in revenue say that 64% of their new applications in 1990–1991 will be implemented on mainframes. Longer term, the big systems will be used to implement 54% of new applications.

We think these figures suggest that an expanded role for large systems in computer networking is coming about. And this is what's turning up the heat in large systems.

David R. Brousell, Editor

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LARGE SYSTEMS ARE HOT!

The latest DATAMATION/Cowen & Co. survey reveals that demand for IBM and compatible large-scale systems is rallying, as average system prices soar and new applications continue to find a home on increasingly network-oriented Big Iron.

BY JEFF MOAD

Don't look now, but that dinosaur of information technologies—the corporate mainframe system—may finally be moving into the role that its backers have been advocating for the past several years—the very large server of information-processing services in expanding networks of personal computers, workstations and minicomputers.

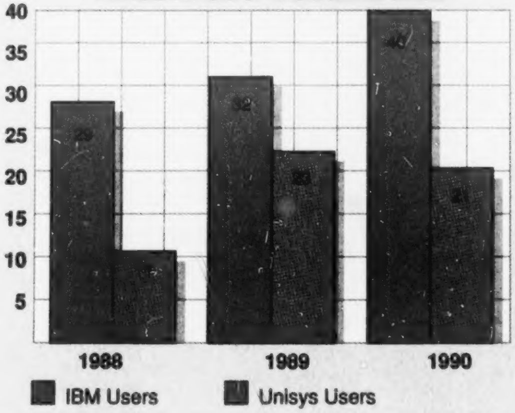
While continuing to face tighter hardware budgets, corporate users responding to the 13th annual DATAMATION/Cowen & Co. Large and Midrange User Survey say they are still building new applications around large systems. Many of those applications require distributed processing, and increasingly they involve large networks of PCs. To support those networks, many large users say they will buy bigger and bigger complexes of mainframe processors, memory and storage.

Most users don't expect IBM to help anytime soon by shipping Summit—the code name for its long-rumored next-generation large multiprocessor mainframe. But that's not going to stop users from

Where the Resurgence Is Taking Place...

IBM users plan to increase the value of their large-systems installations as a percentage of their installed bases over the next 24 months.

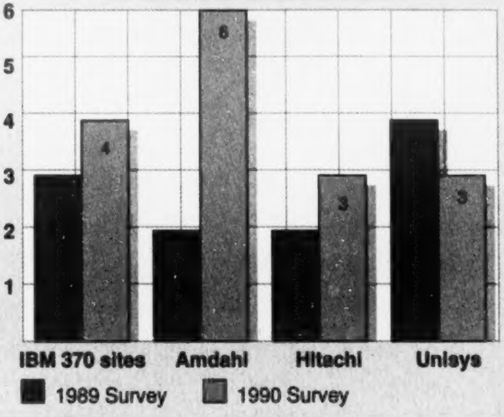
VALUE OF PLANNED INSTALLATIONS AS A PERCENTAGE OF INSTALLED BASE



In Unit Growth...

Amdahl, Hitachi and IBM users plan more new installations as a percentage of their large systems already in place.

PLANNED NEW INSTALLATIONS AS A PERCENTAGE OF LARGE SYSTEMS IN PLACE



Users are buying larger systems, and they're writing the applications themselves.

installing IBM's largest systems. In fact, the survey shows that IBM users now expect to increase the value of their installed large-system hardware bases by 40% over the next two years. That's up from 32% last year and 29% in 1988.

Overall, users say the number of new mainframes they'll be adding will be up modestly. Users of IBM 370-architecture machines, for example, will increase large systems in use by 4% in the 1990-1991 timeframe, up from 3% last year. For Amdahl Corp. users, the installations will be up 6%, compared with 2% last year. And Hitachi Data Systems Corp. users (the former National Advanced Systems Corp. base) will increase their installed mainframe bases by 3%, up from 2% in 1989. Only users of Unisys Corp. mainframes will be adding systems at a slower rate, 3% compared with the 4% they cited last year.

But what's significant is the cost and the apparent size of the mainframe systems users are buying and the fact that they are often building new applications to run on these large-scale systems. For the first time since 1986, the average price that IBM 3090 users expect to pay for systems is up. Those users expect to pay a whopping $4.2 million per system, up almost 56% compared with the $2.7 million they cited last year. And the dramatic user preference for large, multiprocessor systems, increased memory and storage seems to reflect a trend toward intensified data center consolidation. It also undoubtedly reflects increased IBM systems software prices and the decision to limit some mainframe field upgrades.

Interestingly, the survey suggests the much-ballyhooed user push for outsourcing has been overstated. Users are buying more and larger systems, and they're writing the applications and running those large systems themselves. Asked to measure their interest in outsourcing on a scale of 1 to 5, with 5 representing no interest, users from large organizations with annual revenues over $500 million averaged a 4.47 response. Interest at smaller organizations was even lower. Seventy-seven percent of all respondents say the IS department still has procurement responsibility for office, as well as traditional, computer systems.

As the answer to the outsourcing question shows, the majority of users are continuing to run their own IS organizations. And, perhaps surprisingly, given all that's been said and written about the rise of workstation networks and low-cost UNIX machines, users are continuing to build most new applications around the proprietary mainframe. In fact, survey respondents from companies with $50 million or more in revenues say that 64% of their new applications in 1990–1991 will be implemented on mainframes, with 18% on minicomputer-based departmental systems and another 18% on PCs and workstations.

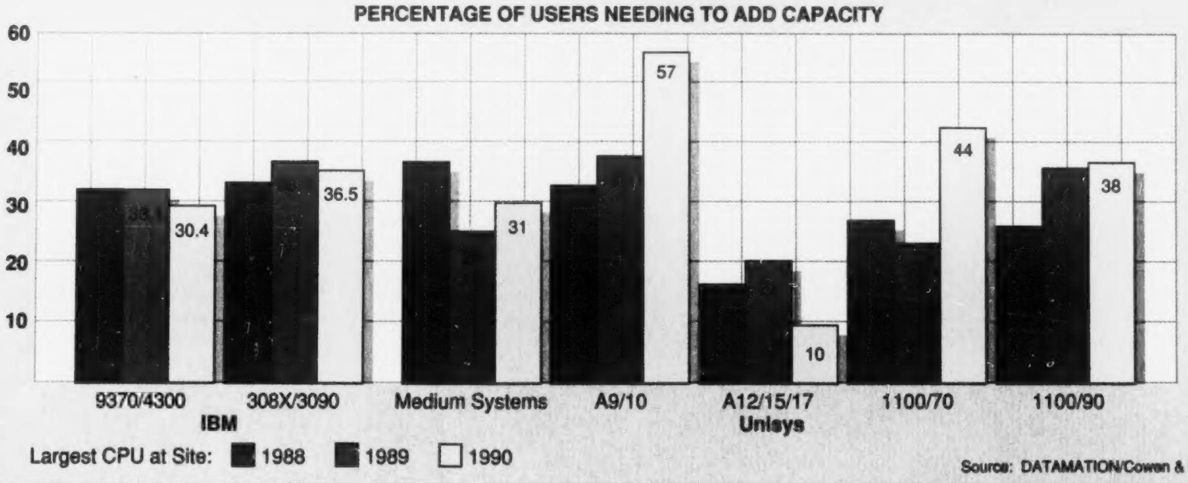
Of course, PCs and workstations are continuing to account for higher spending percentages and to carry more of the IS load. But larger users now say that, even in the longer term (i.e., beyond 1991), 54% of new applications will be implemented on mainframes. At the same time, 27% of those new applications will be implemented on PCs and workstations, and a steady 19% will go to minicomputer-based departmental systems.

PCs and workstations are playing a larger role at smaller organizations. Respondents from companies with less than $50 million in annual revenues say that 50% of their applications are written on mainframes today, a number they expect to drop to 41% in the longer term. The PC/workstation share, meanwhile, will rise from 20% today to 28% over that period.

But mainframes will have a significant role in distributed applications. Forty-five percent of IBM users say mainframes will be their "principal hardware

And in Capacity

Still more than 30% of IBM 9370/4300 and 308X/3090 sites say they need more capacity, but less than last year. Many Unisys users say they need more capacity, too.



Source: DATAMATION/Cowen & Co.

orientation for the implementation of [their] newest distributed-processing applications."

Users already seem to be well along in linking PC and workstation networks to their large systems. Eighty-seven percent say their PCs would either increase mainframe work loads or have no effect on them, down slightly from 90% a year ago. In 1990, 84% of survey respondents have already connected at least some of their PCs to the mainframe. And another 10% say they will do so this year or next.

> The survey suggests the much-ballyhooed user push for outsourcing has been overstated.

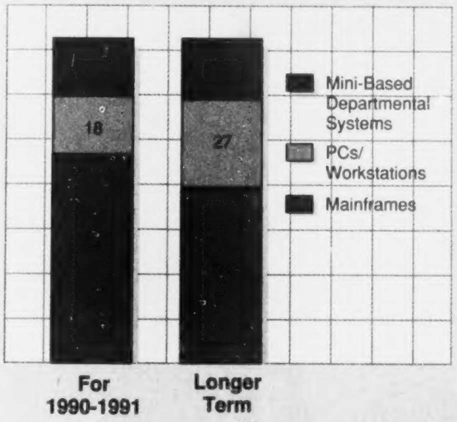
Many users who are planning to buy significantly larger mainframes may be responding to what they see as a bargain. The survey shows that, into the first months of 1990 at least, IBM and vendors of compatibles continued to be willing to cut good deals. Users say Amdahl was the discount leader, offering discounts that averaged 20.3%, up from 16.9% last year. Hitachi Data Systems was second at 16.2%, actually down slightly from last year, perhaps reflecting HDS' ongoing inability to meet demand for its products. IBM offered 11.5% discounts, on average. That was up from 9.9% last year. IBM's discounts have increased every year since 1987, when they averaged 7.6%. The expected increases in average system prices probably take into account vendor discounting.

Also spurring the trend toward larger mainframes, at least among users of IBM and compatible systems, is the acceptance of MIPS-devouring new products such as the MVS/ESA operating system. Although users have implemented ESA more slowly than they at first indicated they would in the 1988 DATAMATION/Cowen survey, acceptance still appears to be broad and strong. Eighty-nine percent of IBM MVS/XA users, for example, say they either already have implemented ESA or plan to do so. The 11% who have no plans to do so is down from 25% last year.

Where New Applications Are Going

PCs and workstations are picking up in companies with $50 million or more in revenue, but even in the longer term, mainframes still lead.

% OF NEW APPLICATIONS IMPLEMENTED



Source: DATAMATION/Cowen & Co.

The MIPS Eaters

Interest also appears to be strong for another MIPS-eater, IBM's new large-system application development environment, AD/Cycle. Among current users of IBM's popular DB2 relational database management system, 17% say they plan to implement AD/Cycle, and another 48% say they will evaluate it.

DB2 continues its inexorable market share assault. Fifty-three percent of users say they plan to implement DB2, up from 43% who said so last year. DB2 was the only mainframe DBMS to show significant gains in the number of planned implementations.

But IBM is not doing so well on the applications side. Only 54% of users say they plan to buy packaged systems and applications software from IBM. Despite the company's considerable marketing and joint venture efforts in this area, that figure is flat from last year.

As users' needs for system MIPS and memory jump, so does their appetite for mainframe disk access storage. Half of IBM 308X/3090 users plan to add disk drives this year, about the same as last year. Thirty-three percent plan to add tape drives, up slightly from 1989.

Clearly, IBM's new 3390 disk drives, which started shipping late last year, are sparking much of that demand. Already, 48.6% of IBM users say that when they buy disks over the next 24 months, they will be buying the larger 3390 variety rather than the 3380. And, as the only announced vendor of 3390-class devices, IBM's share of the entire multibillion-dollar compatible disk business will grow significantly. IBM drives account for 91% of units users are planning to purchase. That's in addition to the 78% of the already-installed units that carry an IBM label.

The Capacity Factor

Although a significant number of users are buying larger mainframes and linking them to PC and workstation networks, there's still pressure on IS hardware budgets. The rate of growth in user hardware budgets continues its downward slide, reflecting the demands most IS organizations are under to produce more with less. Users of IBM's high-end systems say their hardware budgets will grow at a 6.9% annual rate over the next three to five years, down from 7.4% last year and 8.5% in 1987 (DATAMATION's recent 1990 budget survey showed an expected 6% increase in user budgets. See, "Recovery!" April 1, 1990, p.22). Unisys users this year put their budgets' growth rate at 6.1%, down from 6.8% last year. That suggests that plans to buy larger, more expensive mainframes this year aren't distributed evenly through the user base. Instead, they are probably concentrated among larger system users.

The apparent dichotomy of user hardware purchase budgets heading down and mainframe installed value heading up is also partly accounted for

Plans to buy larger, more expensive mainframes aren't distributed evenly through the user base.

by increased interest in leasing. Plans among 3090 users to enter into short-term leases with IBM Credit Corp. or third parties has increased from 12% to 15%.

Also contributing to the impression that the push to bigger mainframes is concentrated among the largest users, probably the 3090 side of the house, is the fact that, on average, the percentage of large-systems users saying they need more mainframe capacity is down. Among 308X/3090 users, 36.5% say they'll need more capacity this year and next, down from 38% last year, but up from 34.4% in 1988. The percentage of IBM midrange users needing increased capacity is down, as well.

The need to do more with less may be a factor in the unmistakable streak of dissatisfaction users are exhibiting toward many of their large-system vendors. Users seem skeptical about mainframe vendors' ability to deliver the right products and services, particularly when it comes to IBM and Unisys. Although IBM chairman John Akers for the past several years has urged his charges to focus on the customer first, 19% of IBM users this year say their attitudes toward IBM are less favorable. That compares with 18% who say they feel more favorable toward Big Blue. IBM's less favorable figure last year was 16%, and in 1988 it was just 10%.

Reflecting that skepticism, most IBM users in the survey say they haven't decided to embrace the vendor's comprehensive Systems Application Architecture. Only 33% of all IBM sites say they definitely will migrate to SAA, up only slightly from 31% last year. AS/400 and 3090 E, S and J users are the strongest SAA backers.

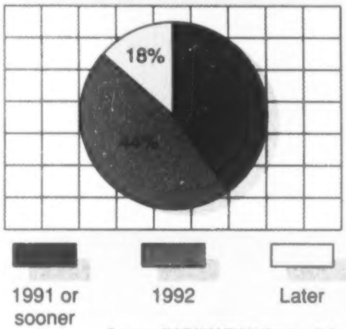
Users are looking askance at IBM, at least in part, because they have little confidence that the vendor will be able to deliver a much-needed successor to the aging 3090 mainframe line anytime soon. Only 38% of IBM mainframe users say they expect the vendor to deliver the Summit mainframe in 1991 or sooner. Forty-four percent predict that the next generation system will materialize in 1992, and 18% say it will be even later. As a result, most users expect IBM to deliver lower average annual price/performance improvements—12.4% in 1990 compared with 14.5% in 1985.

That spells some potential gains for plug-compatible mainframe manufacturers (PCMMs), although some users are clearly wary of the recent changes affecting one vendor, HDS. The PCMMs lost ground in the installed 300xx-class systems market last year, falling from 16% of the market in 1989 to 13% in 1990. But, at the beginning of this year, their star began rising. Twenty-six percent of users say their attitudes toward PCM suppliers is more favorable compared with 7% who say it is less favorable. And 22% of mainframe users say they are considering using a PCM vendor, up from 19% in 1989.

Summit: Over the Next Hill

Most IBM users expect the 3090 successor to arrive next year or in 1992.

WHEN USERS EXPECT THE POST-3090 FAMILY



Source: DATAMATION/Cowen & Co.

Only user caution concerning HDS clouded the PCM picture. While 38% of HDS customers say their attitude toward the vendor has become more favor-

Larger PC Fueling Market Growth

Although practically three out of four survey respondents say they need more PC capacity in 1990, users expect to buy just slightly more PCs in 1990 at higher average unit prices, according to the PC segment of the DATAMATION/Cowen & Co. 1990 survey.

On the demand level, the projected 1990 capacity increase of 74% is up from 69% in each of the last two years and far outdistances perceived capacity requirements for mainframe, disk storage or departmental systems.

Users say they expect to increase PC unit purchases in 1990 by only 1.2% and see 8% higher average unit prices. This PC unit growth rate is far off the rapid pace of recent years but is better than the 0.3% users cited in last year's survey. And at 9.3%, projected PC dollar shipment growth is better this year than the 5.8% projected last year.

The increase in PC spending seems to be tied to a shift toward larger desktop systems. Users say they expect to spend an average of $3,900 for personal computers this year. That's up from $3,600 last year.

The increase signals a shift toward 80386-based PCs, but not necessarily a trend in favor of IBM's struggling OS/2 operating system. Forty-three percent of users say they'll buy PS/2 model 80, 70, 55 or SX systems this year, up from 34% last year. But only 13% say they expect to use OS/2 in the future. That's down from the 15% that planned to use OS/2 last year. MS-DOS actually gained a point from 79% to 80%, as did UNIX, which went from 4% last year to 5%. Nor are users doing Windows. Sixty-one percent say they have no plans at all to implement the Microsoft user interface; 26% say they already have done so or plan to do so this year.

Users also plan to increase spending on PC networks. Eighty-four percent of users say they'll buy more or the same number of new devices to connect to their networks as they did last year. The primary beneficiary of that trend seems to be Novell Inc., whose leading market share position increased from 31% last year to 37% in this year's survey. Novell, however, is followed closely by IBM as a supplier of local area networks to our survey group.

On the PC packaged software side, market share increases are in the cards for WordPerfect for word-processing applications, Oracle and Borland for database management, and Microsoft and Borland for spreadsheets. A corresponding weakening of market share is projected for IBM DisplayWrite in word processing, Ashton-Tate in databases and Lotus 1-2-3 in spreadsheets, although the latter two still hold very dominant positions in their respective markets.

Although many Unisys users say they are unhappy, few are actually jumping ship.

able in the last year, 27% say they are likely to switch vendors when it comes time to replace their mainframe. That figure is up from 12% in 1989 and reflects user uncertainty generated by the sale of NAS to Hitachi Ltd. and Electronic Data Systems Corp.

90 RESEARCH
LARGE SCALE SYSTEMS SURVEY

The Scoop on Unisys

Also slipping in the eyes of its users is troubled Unisys Corp. Forty-five percent of Unisys users who say their attitude toward the mainframe vendor is less favorable this year are seriously considering switching vendors. Overall, 21% of Unisys users say they are seriously considering switching vendors.

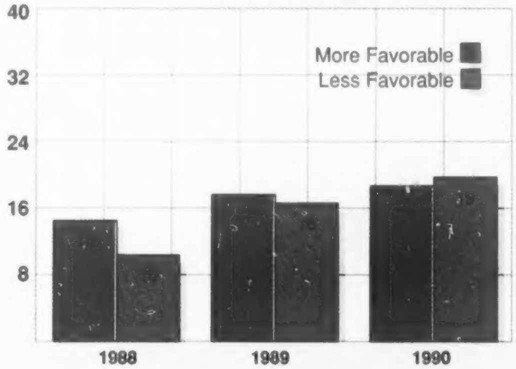
That may not be surprising for a vendor that was plagued by financial problems through most of 1989. But what is somewhat surprising is what Unisys users say is bothering them. Historically, Unisys users have complained loudest about the lack of packaged software available to run on their systems. This year, however, the discontent has clearly shifted to the company's sales force, which apparently has been affected by repeated Unisys layoffs. Asked which of Unisys' products and services needs improving, 63% of users offering suggestions mention the sales staff; just 4% point to the availability of packaged software. Only 17% of Unisys users complained about the company's sales force last year.

Despite the obvious signs of discontent, however, Unisys' large-systems prospects for 1990 look surprisingly good. Although many Unisys users say they are unhappy, few are actually jumping ship. Competitors replaced only 2% of the (former Sperry Corp.) 1100/2200 mainframe installed base last year, up from just 1% the year before. And, on what

What Users Say About Satisfaction

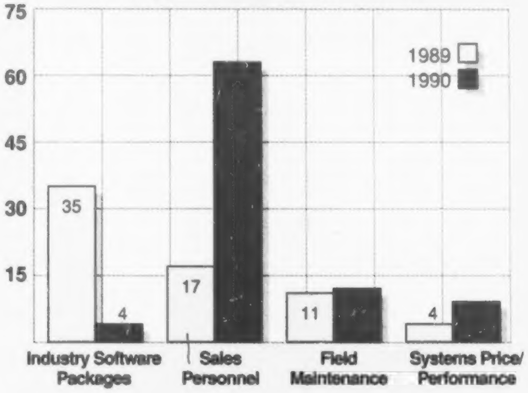
Users at 308X/3090 sites are growing increasingly dissatisfied with IBM

% CHANGES IN ATTITUDE TOWARD IBM
308X/3090 Sites Only



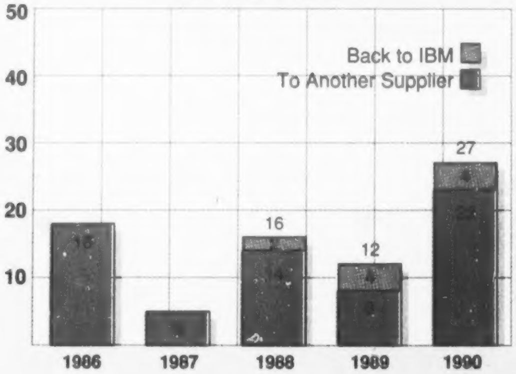
Unisys' sales force takes its lumps

% OF UNISYS PRODUCT OR SERVICE MOST IN NEED OF ATTENTION



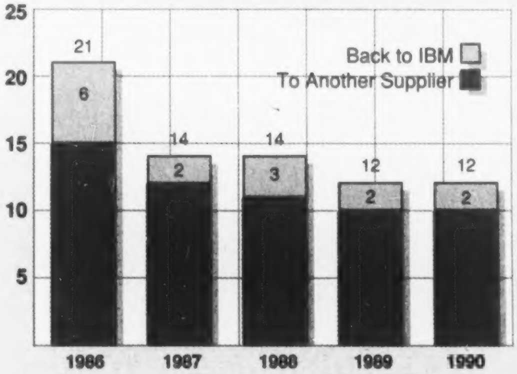
When the time comes to replace systems, more than one in four HDS users intend to jump ship.

% OF HDS USERS PLANNING TO SWITCH VENDORS



The Amdahl base is holding steady.

% OF AMDAHL USERS PLANNING TO SWITCH VENDORS



Source: DATAMATION/Cowen & Co.

used to be the Burroughs Corp. side of the house, things are even more stable. Only 2% of the large A series mainframe installed base was lost to competitors, while none of the medium-scale part of the A series turned over, according to the survey.

Moreover, there seems to be considerable pent-up demand for more capacity in both the 1100/2200 and A series mainframe lines.

On the 1100/2200 mainframe side, 44% of 1100/70 users say they will need more capacity this year compared with 24% last year. That makes them good candidates to move up to new 2200/400 systems. Thirty-eight percent of 1100/90 users say they need more capacity, up slightly from last year.

Unlike the IBM large-systems market, growth in the Unisys base seems largely tied to product cycles. For example, 57% of A9 and A10 series users say they'll need more capacity in 1990 and 1991, up from 39% in 1989–1990. Similarly, 31% of potential V series midrange system users say they need more capacity. Unisys recently announced major additions to that product family.

Unisys, however, does not figure to enjoy the same kind of substantial jump in the dollar value of new systems that is planned by users of IBM and PCM mainframe gear. Users plan to increase the value of their installed Unisys systems by 21% over the next two years, down from 23% in 1989.

Digital is also showing some renewed strength. This year, 15% of survey respondents identify the vendor as their current principal supplier, and 17.8% say Digital will be their principal future supplier of departmental systems. That is a marked improvement over last year's survey, in which 13.2% said Digital was their current principal supplier, and only 13.3% thought Digital would fill that role in the future.

Perhaps even more significant, Digital's new VAX 9000 line appears to represent a competitive weapon for the minicomputer vendor to wield against IBM. Forty-five percent of surveyed IBM users planning to buy a VAX 9000 say the system will replace an IBM box. But only 37% of the VAX 9000s will replace Digital systems.

Just as mainframes are not going away anytime soon, the survey shows continuing—although slowly shrinking—demand for minicomputers. Opportunity seems to be particularly strong for continued growth in spending on IBM's AS/400, but second-tier vendors such as Wang Laboratories Inc. will continue to suffer.

Overall, users say minicomputers and departmental systems will make up a smaller percentage of their distributed and office systems this year than they did last year. The minicomputers' and departmental systems' share of the distributed market shrank from 25.8% in 1989 to 20.5% in 1990, while their share of office systems was down from 17.8% to 15.6%. Gaining in both categories are mainframes and networked PCs and workstations.

Things are rosier, however, for IBM's S/3X line and its successor, the AS/400. Users plan to increase their spending on

IBM Plans Additions for the 3090

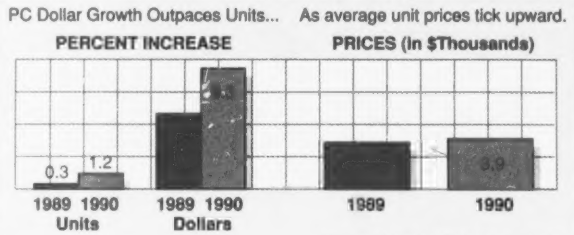
Although the DATAMATION/Cowen & Co. large system and midrange user survey indicates that most users don't expect IBM to ship its next-generation Summit mainframe until late next year, IBM can't afford to stand still. Nor does it intend to, if recent remarks by IBM's large-systems executive are any indication.

Bernard M. Puckett, IBM vice president and president of the Data Systems Division, in a recent address to survey subscribers, indicated that Big Blue is planning a series of functional additions and non-CPU performance kickers that the company hopes will allow the aging 3090 line to hold its own against the mainframe competition. Puckett declined to say when IBM will again upgrade the 3090s, although many observers are betting it will be around June, when competitor Hitachi Data Systems Corp. is due to announce a new large multiprocessor complex. Puckett did, however, say what IBM is planning for the 3090:

- A way to tie together more than one mainframe processor complex while maintaining a single system image of the whole machine. Puckett called this "Very High-Performance Interconnect."
- Faster system channels and a way to allow users to separate storage from CPUs by more than the current 400-foot limit. Observers are betting that means new 9-megabyte-per-second channels and an optical channel option.
- Faster memory. Puckett said IBM is hard at work doubling the switching speeds of its memories and building a 64-megabit implementation.
- Functional improvements in the areas of security, system management, application productivity, transaction processing, enterprisewide data access and connectivity.

Puckett says IBM is encouraged about the current mainframe demand picture. Users, he said, are beginning to create enterprisewide networks of workstations and large systems and to use (ESA) to support those networks. And he also threw cold water on the notion that mainframes are dinosaurs: "As the person responsible for the care and feeding of these dinosaurs, the species I see coming out of our breeding grounds looks rather frisky to me."

PCs Still Showing Strength



Source: DATAMATION/Cowen & Co.

How the Survey Was Done

Questionnaires for the 1990 DATAMATION/Cowen & Co. survey of mainframe and midrange users' buying intentions were mailed in the first quarter of 1990 to 70,649 large-scale and midrange system users in the United States and Canada. Of that total, 48,038 were mailed to IBM large-system users; 17,861 to IBM midrange system users; 4,318 to Unisys sites and 432 to Cray users. In all, there were 3,683 replies, representing a 5.2% response rate. After the elimination of invalid replies and multiple returns, the unduplicated count of questionnaires used in the survey was 2,756, representing a 3.9% response rate.

S/3Xs and AS/400s by a whopping 85% of the value of their already-installed systems over the next two years, even though the AS/400 is already far along in replacing the installed base of System/3X computers. The figure represents both continued replacement of S/3X systems by the AS/400 and higher average AS/400 system prices.

Minis Hang Tough

The AS/400 already represents 21.3% of the value of all installed IBM midrange systems. But respondents say they expect that to grow to 74.9% of installations within the next two years, making the AS/400 the dominant IBM midrange system. At the same time, users say they expect the average price they pay for AS/400s to more than double this year from $235,000 last year to $479,000 in 1990.

Meanwhile, however, mini vendor Wang Labs has virtually vanished from users' future office system purchase plans. Only 7% of user organizations identify Wang as their current vendor for word processing and text editing. And none say they plan to buy more Wang gear this year or next.

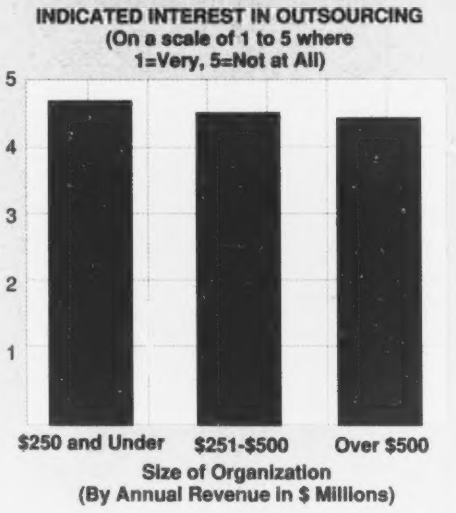
UNIX, meanwhile, seems to be gaining momentum only among departmental systems users. Only 9% of IBM mainframe users deem UNIX desirable, the same percentage as last year. And UNIX on PCs has progressed only slowly. In departments, however, 20% of IBM users say UNIX is desirable, up from 17% last year. Among Unisys users, 34% like UNIX compared with 30% last year.

In the area of technical computing, supercomputer vendor Cray Research Inc. looks to be on the verge of a big year. Thirty-three percent of Cray users say they need more supercomputer capacity, up from 29% last year. And users say spending for Crays will increase over the next two years by 41%, up from 22% last year.

Even rumors of Cray's risky upcoming C-90 product transition and mounting supercomputer competition from IBM and others don't seem to be bothering Cray users. Seventy-eight percent say speculation about new products from Cray and other vendors is having no impact on their supercomputer purchase plans. ▭

Is Outsourcing a Myth?

Large-system users show little interest in hiring an outside systems integrator or facilities manager to run in-house operations.

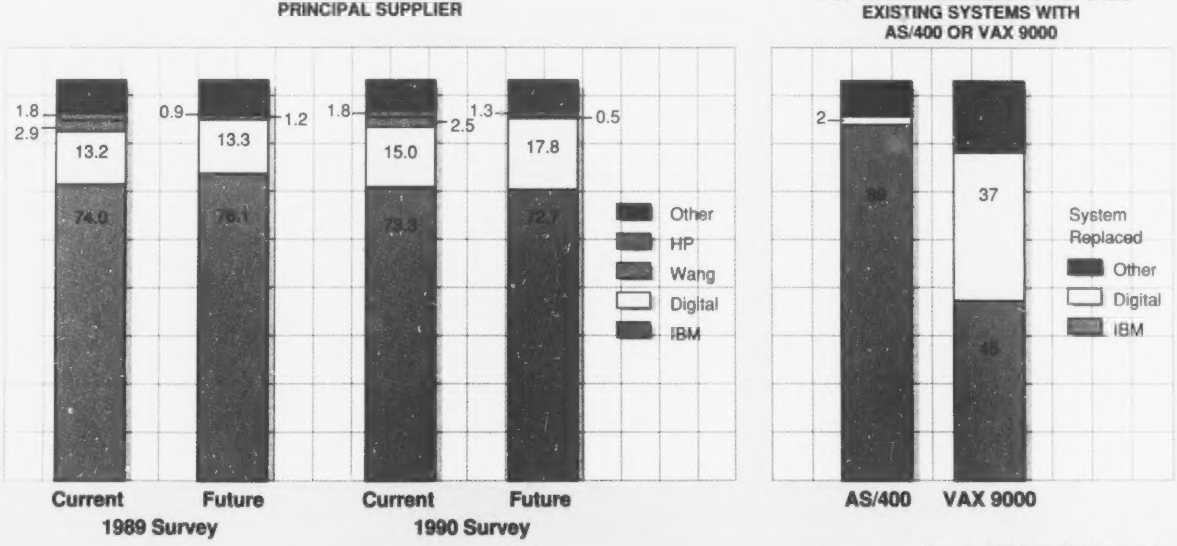


Source: DATAMATION/Cowen & Co.

Things Look Up for Digital

The mini maker's share of the departmental systems market is growing.

The VAX 9000 is poised to dent IBM when users replace systems.



Source: DATAMATION/Cowen & Co.

Ease of Use Coming To PC Graphics

A lack of standards and executive reluctance to dabble in detail once clouded the picture for widespread use of PC presentation graphics packages. But easier to use software may open the way for better corporate ratings.

BY DONNA BARRON

Unlike desktop publishing, which took off like a rocket in the mid-1980s, the market for desktop presentation graphics is so far slow to get off the ground. Where desktop publishing was propelled into the big time by the potent duo of the Apple Mac and Aldus PageMaker desktop publishing software, the so-called desktop presentations market has yielded no such combustible combination of products. But don't count it out just yet.

According to William Coggshall, president of Desktop Presentations Inc., a Mountain View, Calif., market research firm, yearly sales of presentation graphics software for the combined IBM PC and Macintosh market are growing fast, although not at the hyperkinetic speeds of some other PC software. Sales jumped from 530,000 units in 1987 to 950,000 units in 1989. He predicts this figure will reach 1.65 million by 1993.

Applications Galore

If more of the over 35 million MS-DOS computers aren't being used to prepare slides and overheads, it's not for lack of applications software. Presentation graphics packages range from single-purpose programs for producing just graphs, charts or drawings to full-featured packages that can do everything connected to giving corporate presentations from producing 35mm color slides to aiding in speech writing. The three most popular full-featured presentation packages are Software Publishing Corp.'s Harvard Graphics and Lotus Development Corp.'s Freelance Plus for IBM PCs and compatibles, and Aldus Corp.'s Persuasion for the Mac.

These leading graphics packages output to a variety of printers and slide makers, send slides or transparencies to remote service centers via modem or disk for processing and use the computer itself (or in conjunction with a projection device) to present on-screen video presentations.

Coggshall calls these screen-based presentations "electronic glimpses" and claims they represent the fastest growing category of computer-generated visuals. In 1989, Coggshall estimates, computers were responsible for creating 245 million transparencies, 157 million slides and 59 million electronic glimpses. He forecasts that these numbers will grow to 936 million transparencies, 316 million slides and 284 million electronic glimpses by 1993 and that by 1995 screen-based images will exceed the number of computer-generated slides produced.

Mary Grant, training manager for

ENGELHARD'S GREMBOWICZ: Access to in-house film recorders has simplified and sped up the creation of slides.

Photograph by Andy Holbrook/Black Star

Northland Insurance Cos. in St. Paul, is a believer in the electronic glimpse concept. She has been using Harvard Graphics to create PC-based presentations for the past three years. The majority of her creations are employee training programs. However, the availability of a BARCO color projector and SilentPartner, a device for remotely controlling the computer, has made the training room a popular place for presenting computer-based visuals as an attractive alternative to slides or overhead transparencies.

"If someone will be making a presentation away from the site, we'll prepare slides—we have an ImageMaker slide printer hooked up to our PC—but whenever we do a presentation in our own training facility, it's easier and more efficient for us to do a computer-based show," says Grant.

Another device that is likely to encourage the use of on-screen presentations is the recently introduced 480C PC Viewer from In Focus Systems Inc., which the company claims is the first true color liquid crystal display (LCD) panel. The device, which retails for $4,995, sits on top of an overhead projector and reflects whatever appears on the computer screen. It supports up to 640 × 480 dot-per-inch resolution output from an IBM PC, compatible or Macintosh.

In Focus also markets a standard monochrome LCD panel and, for people who want to take their presentations but leave their computers at home when they travel, the 480GS/2. This monochrome memory-and-store LCD panel stores presentations created with a computer and then runs them through an overhead projector directly from the panel, without need of a computer.

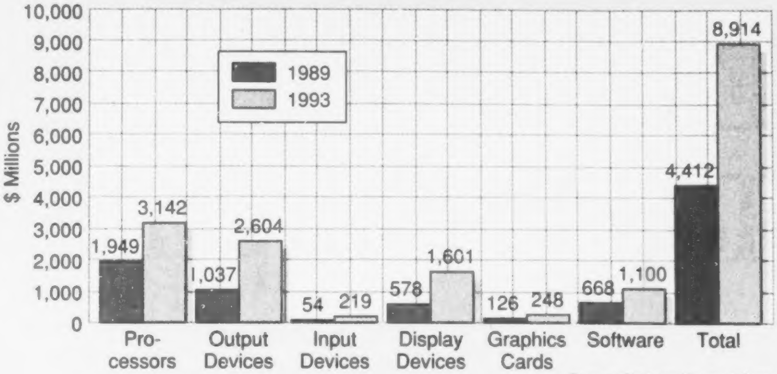
☐ **WHEN IT COMES TO MIXING AND MATCHING COLORS, I FEEL LIKE A DOLT.**

The Joy of Standards

Although the impressive number of software and hardware products on the market for presentation graphics provides users with an exciting diversity of choices, it also leaves the people who must support and integrate these packages—many of which are based on proprietary file formats—under a considerable burden. IS managers are moving slowly into graphics because of perceived support costs and lack of standards in both hardware and software.

The Worldwide Desktop Presentations Market

Compared with hardware expenditures on processors, cards and display devices, software sales command a relatively small part of the total desktop presentations market.



Source: Desktop Presentations

Some of the concerns are being addressed by software manufacturers, many of which continue to provide increasing numbers of drivers for local output devices and remote service bureaus, thereby reducing the need for managers to limit users to a particular software package or file format. Still, standardizing can offer a number of benefits, including more cost-effective use of shared resources, fewer support calls and uniformity of presentation graphics.

For example, everyone at the Iselin, N.J., offices of Engelhard Corp., a *Fortune* 500 company specializing in chemical technology, uses Harvard Graphics to create their presentations. This makes it possible for employees to share the company's four Matrix PCR film recorders (PC-operated devices—comparable to Matrix's SlideWriter for the Macintosh—that convert images on a computer screen into 35mm slides) in much the same way they would share a departmental photocopy machine.

Access to the in-house film recorders has both simplified and sped up the creation of slides, says Michele Grembowicz, a systems analyst with Engelhard's Presentation and Decision Support Group. Anyone who needs slides creates them at his or her desk with Harvard Graphics, saves the work to a floppy, brings that floppy to one of the centrally located film recorders, pops it into the attached PC (which already has the Matrix software loaded onto it) that sends the data to the film recorder. The user then unloads the exposed film from the recorder and sends it to a local company, which processes and returns the mounted slides—within a few hours, if necessary.

"Initially, we have to provide employees with one-on-one instruction on how to load the camera and use the Matrix software, but people require very little additional hardware support after that," says Grembowicz.

When Engelhard decided to institute a uniform slide format for budget presentations in 1988, being standardized on a single software platform made the transition relatively easy, says Pat Benanti, an executive secretary who designed the templates and training materials to implement the change. "We had 50 people—most of whom had received their software training several months earlier, many of whom had not yet attempted to create their own slides, and none of whom had ever had to design slides to specification—all working on deadline at the same time. I thought I would be swamped with calls, but I got very few," recalls Benanti.

Not Always What You Want

For Engelhard, having everyone using the same software guaranteed uniformity of output from the Matrix film recorder. Other companies outputting visuals to a variety of different devices may not be so lucky, however. "What you want is not always what you get, even when you're dealing with the same file format," says Sam Bayer, developer of the Scan Conversion Object Description Language (SCODL), a file format used to translate the PC screen image for the Matrix film recorders.

Bayer, who is also director of marketing at the Orangeburg, N.Y.-based Agfa Matrix Division of Agfa Corp., believes that SCODL hasn't lived up to its potential for a variety of reasons. "SCODL ought to take a lot of the confusion out of the industry, but because the various software vendors seem to put a little bit of their own personality into the way they support the existing formats, not every SCODL on the software side is the same," he says. Consequently, a SCODL file generated in one program often appears differently when loaded into another, even though Matrix film recorders can generate slides from all SCODL files.

Bayer recently formed the Agfa Imaging Center Association, an organization he says is helping to ameliorate this problem by acting as a liaison between people with imaging problems and the software companies.

Lack of standards is also a problem when exchanging graphics among various software packages used to create the images prior to output. The closest thing to universal graphics formats are the computer graphics metafile (CGM) on the PC and PICT on the Macintosh, formats many packages can import and export. However, even CGM files tend to differ from program to program, and when files are moved surprises are possible. Part of the text may be missing, only part of a graphic may appear or the colors can be off. Although most programs can read PICT files, the look of the graphics may change as files move between programs because of the differences in formats or style sheets within the programs.

Several software companies are addressing the problem of file incompatibility. Micrografx Inc. recently announced XPort, a translation engine, which will initially provide translations between CGM, PICT1, PICT2, AutoCAD's DXF, Digital Research Inc.'s GEM and Micrografx's own DRW formats.

Inset Systems Inc.'s upcoming HiJaak2 conversion utility, which should be out this summer, is expected to add vector conversions to the already extensive list of graphics translators in the current version of HiJaak. Digital Research also announced a licensing agreement with Inset Systems that will allow Digital Research to incorporate conversion utilities for importing and exporting files in the Adobe EPS, CGM, DXF, GEM, Lotus PIC, Microsoft Windows, TIF, WMF and Z-Soft PCX file formats into its entire line of GEM graphics programs.

☐ **WHAT YOU WANT IS NOT ALWAYS WHAT YOU GET, EVEN WITH THE SAME FILE FORMAT.**

For managers who have to deal with it, the issue of disparate graphics formats and file incompatibility can present frustrating and even insurmountable problems. But, then again, only about 10% of IBM PC and compatible users today are using their computers to create graphics, and even fewer are preparing the kinds of sophisticated graphics that involve dealing with multiple file formats.

"While we in the computer industry are dazzling one another with spectacular color images and weighing the subtle differences in speed or ease of use which make one presentation software package superior to another, most of the world doesn't even realize this technology exists," says David Peltz, publisher of the "Macintosh Engineering and Scientific Report" and president of CADventures, a Chatsworth, Calif., computer graphics consulting firm.

According to Peltz, the most popular presentation in use today is a black-and-white transparency that's gone through the Xerox machine to make an overhead. "Presentations, for the most part, are still a monochrome world. If I take even the simplest color transparency or slide and use it outside the computer community, the first reaction I get is almost invariably 'Wow, how did you do that?' " says Peltz.

Digital's à la Carte Graphics Menu

When it comes to implementing presentations throughout an organization, figuring out the best way to create the visual materials may be only half the battle. Effective distribution of those creative materials also looms as an important challenge.

"We needed a way to quickly and inexpensively get our slide presentations out to our sales force," explains Laurie McCabe, a program manager with Digital Equipment Corp.'s Media Communications Group. Ordinarily, after a slide presentation is created, it has to be duplicated, packaged and warehoused for future ordering, says McCabe. If the presentation requires updating two weeks later, the whole process has to be repeated. Compounding the problem is the fact that, after a slide show is created, the people who need it most often don't know it exists or where to find it.

Digital's solution to this distribution chaos is the On-line Presentation Access Library (OPAL), a computer-based presentations catalog introduced early this year that operates over Videotex, an electronic library networking software marketed by Digital.

Presentations for OPAL are put together at the company's corporate headquarters in Maynard, Mass. Content is developed by the marketing department, and visuals are designed and executed by the art department, using either dedicated Genigraphics equipment or 35mm Express, a DOS-based presentation software package from Business & Professional Software Inc.

"We chose 35mm Express partly for its ease of use and partly because it provides drivers to a wide variety of output devices," says McCabe. An equally important feature was 35mm Express' ability to accept Genigraphics files, making it possible for Digital's art department to simply modify many existing graphics for use on the PC rather than having to completely re-create them in a PC format.

OPAL is currently available to anyone on Digital's corporate network. After reading a description of the available presentations, OPAL users can select and send themselves the presentations they want via electronic mail. They are offered the choice of either a standard presentation, which can only be used as is without customization, or a 35mm Express version, which can be customized using 35mm Express software on a local PC.

Downloaded files of either variety can be output to local printers or film recorders, or electronically forwarded to Digital's corporate media communications department, which will make up slides or transparencies and return them within 24 hours.

In addition to complete presentations, the OPAL catalog includes templates and guidelines designed to help users maintain established corporate standards when creating their own presentations. An unexpected side benefit of OPAL, says McCabe, is that it has encouraged many PC users to begin creating slides on their own.

OPAL currently contains about 60 entries. When the program reaches maturity, McCabe expects it to include 200 to 300 presentations, including some that are not generated within Digital. "We'll also serve as a slide exchange bureau for presentations created by people in the field," says McCabe. "We may not house all these presentations, but we can at least provide a service for letting people know who has created what presentations and where they can be found."

Products Mentioned

The following is a list of presentation graphics products mentioned in this article:

Aldus Corp., Seattle
(206)-622-5500
Aldus PageMaker
Aldus Persuasion
Circle 101

Barco Inc., Kennesaw, Ga.
(404)-590-7900
BARCO color projector
Circle 102

Business & Professional Software Inc., Cambridge, Mass.
(617)-491-3377
35mm Express
Circle 103

Digital Research Inc., Monterey, Calif.
(408)-649-3896
GEM
Circle 104

In Focus Systems Inc., Tualatin, Ore.
(503)-692-4968
480C PC Viewer
Circle 105

Inset Systems Inc., Brookfield, Conn.
(203)-775-5866
HiJaak 2
Circle 106

Lotus Development Corp., Cambridge, Mass.
(617)-577-8500
Freelance Plus
Circle 107

Micrografx Inc., Richardson, Texas
(214)-234-1769
XPort
Circle 108

Microsoft Corp., Redmond, Wash.
(800)-426-9400
Microsoft Windows
PowerPoint
Circle 109

Presentation Electronics Inc., Rocklin, Calif.
(800)-888-9281
SilentPartner
Circle 110

Presentation Technologies, Sunnyvale, Calif.
(408)-730-3700
ImageMaker
Circle 111

Software Publishing Corp., Mountain View, Calif.
(415)-962-8910
Harvard Graphics
Circle 112

Even many experienced computer users prefer not to deal with the complicated issues involved in designing presentation graphics or working with color. According to a survey by *PC Week* magazine, one of the most sought after qualities in a presentation graphics package is preformatted templates.

"Most of the time, when I sit down at my Macintosh to start a new presentation, I just grab one of the templates that came with [Microsoft Corp.'s] PowerPoint, save it with my file name, and start cutting and pasting into that outline. It's just such an easy way to do it," says Robert Lucas, a project leader for software developer Applied Computer Services Inc. of Simi Valley, Calif.

The Power of Persuasion

Another package packed with predrawn presentation templates—Aldus Persuasion—has become the standard for Macintosh users at FMC Corp., a large multinational company in the agricultural, industrial chemical and defense-contracting businesses.

"The people preparing presentations here are typically managers, professionals, knowledge workers and secretaries—people who have had very little training in what looks good with what," says Christine Leatz, FMC's Chicago-based manager of office technology worldwide. Not only do FMC employees make heavy use of Persuasion's packaged templates but in-house graphic artists have developed special FMC templates of their own featuring the FMC logo. These have been distributed throughout the company.

"We're not so much concerned about our presentations being uniform as we are that our logo be the right color and size and be placed in the right position. We also have strict security guidelines and need to be sure people include the appropriate information, such as copyright, on their slides," says Leatz.

One of the reasons Leatz decided to standardize on Persuasion was the fact that a Microsoft Windows-based version is expected out soon for the PC. "Our people on PCs are currently using Harvard Graphics and Lotus Freelance, but we've found that these require a far greater amount of MIS support than Persuasion because they're not Windows-based and don't use a graphical user interface," says Leatz.

A Windows version of Microsoft PowerPoint is expected out soon, and it seems likely that the porting of easier-to-use Macintosh products to Microsoft Windows on the PC will be a continuing trend. Then, the pending release of Microsoft Windows 3.0 should open the market to many new graphics products, including presentation packages.

Still a Support Function

But even with easy-to-use software on the horizon, there's no guarantee that desktop presentations will ever become as popular as spreadsheets or word processing. Part of the problem, particularly among PC-compatible users, is that—unlike in the case of desktop publishing—the majority of the people who need presentation graphics are not the people who prepare them. The preparation of visuals continues to be largely a support function, and this is not likely to change.

Says CADventures' Peltz: "When word processing came out, you had WP pools. Everybody wrote things down on paper and took it to the pool. Presentations are still for the most part that way. Instead of a WP pool, there's the art department."

What will change is the availability of graphics-capable hardware on the typical desktop. As computer hardware prices continue to come down—and more powerful, higher resolution graphics-based systems increasingly replace older, less functional equipment—many analysts expect to see a commensurate increase in the number of presentations being created on the desktop.

The ability to run presentation software over a network should further accelerate widespread use of graphics. Lotus recently announced that a network version of Freelance Plus will be available in the second quarter of this year. Digital Research is also expected to release a networked version of its Presentation Team product fairly soon. Networkable software makes it easier for an administrator to do maintenance updates and ensure that everyone is using the same version of the software. It will also give users the ability to share expensive output devices.

Whether it is the nature of presenters to procrastinate or simply a desire to provide the most up-to-the-minute data, the preparation of presentation materials remains a rush-rush affair. It is probably this, more than anything else, that will fuel the demand for desktop control of presentation graphics. After all, how many art departments can you find open at 3:00 in the morning? And how long can you wait for changes when your presentation is only hours away? ▭

Donna Barron is a freelance writer based in Hollywood, Fla., who covers the computer industry.

USAA's Image Of Success

This big insurance company attracted loads of attention when it first cranked up its Texas-sized image system along with partner IBM. Now two years into the project, the USAA knows what to expect from this technology of tomorrow.

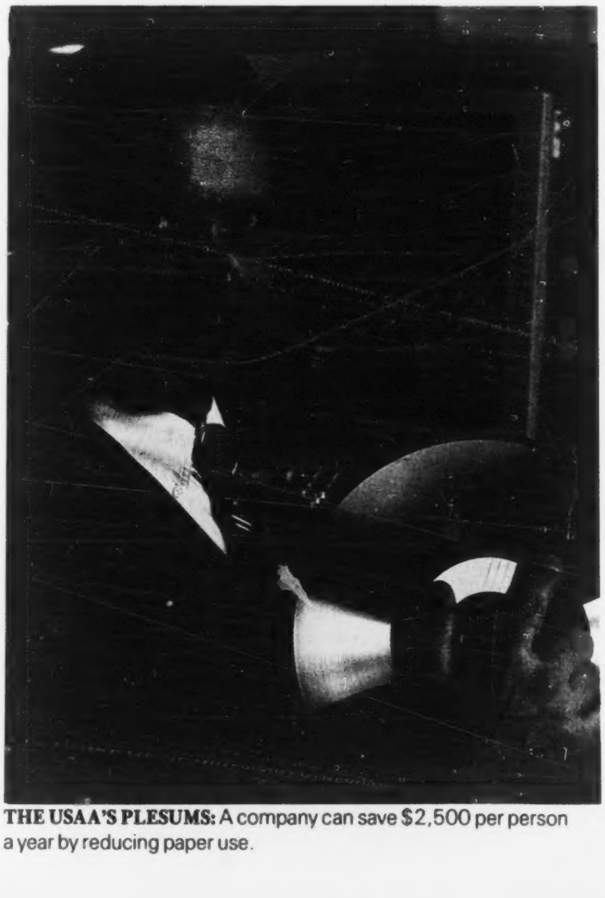
BY EMILY LEINFUSS

The United Services Automobile Association is one of the most image conscious companies in the world. This aggressive San Antonio-based insurance and financial services firm projects that, by the year 2000, it will have 20,000 users of image-processing terminals. A pioneer in optical storage for three years, the USAA clearly has one of the most ambitious imaging strategies anywhere.

For the past two years, IBM has worked on site with the USAA, phasing in what is now called IBM's MVS/ESA ImagePlus system. Some 2,000 workers now use 1,400 imaging terminals every day, and two IBM 4390 mainframes serve as system controllers. The image system automates certain customer service operations in the Property and Casualty Policy Service and Underwriting (P&C) area, which represents about 80% of the USAA's business.

The Paper Trail

The USAA's interest in imaging is part of an ongoing search for efficiency. The company was started in 1922 by an army officer who bought a new car and found that insurance companies would not insure him, or anyone else, who moved every two or three years. So he formed a club with other army officers to insure each other. That club became the USAA, which now serves about 2 million military officers, former officers and their dependents.



THE USAA'S PLESUMS: A company can save $2,500 per person a year by reducing paper use.

Photograph by Kevin Vandiver/Black Star

Unlike other insurance and financial services companies, the USAA does not have agents in the field. Customers deal directly with the home office for any insurance transactions, creating a huge volume of mail and telephone calls.

The foundation for imaging at the USAA can be traced back to a mission set forth in 1969 by chief executive officer Brigadier General Robert F. McDermott, who wanted to see the USAA transformed into a completely paperless company. The first steps began in the 1970s when the USAA improved its manual paper-handling procedures and switched the bulk of its business from mail to toll-free telephone service. Today, the USAA operates the largest automatic call distribution telephone service in the world.

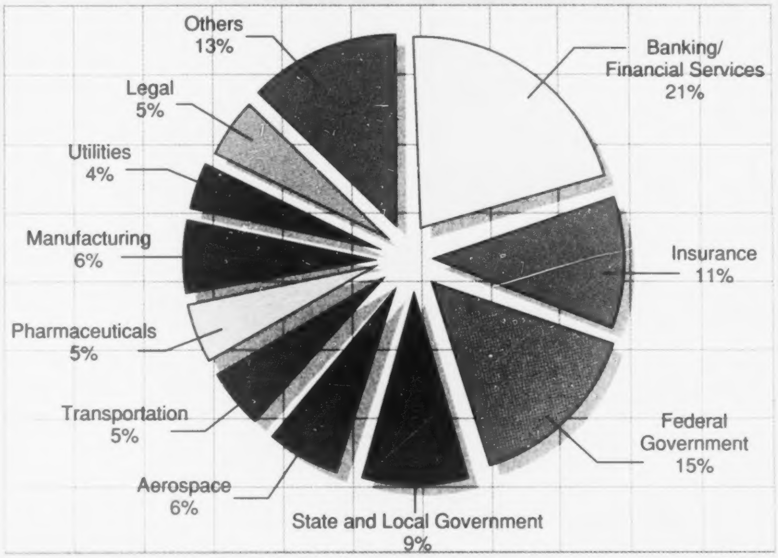
By the early 1980s, image systems had just started to emerge, as had many other computerized solutions to traditional paper pushing. As a way to quantify its plans for all computer systems, both imaging and otherwise, the USAA created a Long Range Systems Plan (LRSP) to modernize systems and procedures. By 1981, the USAA was ready to implement McDermott's mission to eliminate paper.

The LRSP first began to take shape in the form of the USAA's Automated Insurance Environment (AIE), which was fully implemented in 1986. According to General Donald Lasher, president of information services at the USAA, the AIE is a highly integrated and interconnected system that resides on IBM 3090 mainframes. It processes over 6 million IMS transactions every work day.

With the AIE, USAA agents enter information into the system as they collect it from customers holding homeowner, automobile and other USAA insurance policies. Full im-

Where Imaging Counts Most

By 1989, a total of 515 image-processing systems had been installed in the United States. Total market size was $519 million, with banking and financial services accounting for the largest market share.



Source: International Data Corp.

plementation of just the P&C portion of the AIE cost $130 million and took more than five years.

Lasher says the USAA has always envisioned imaging as part of its overall systems plan. The first imaging test, a prototype from St. Paul-based 3M, was in operation from 1984 until 1987 and served about 2% of the P&C policy service customers. Another test system, from FileNet Corp. of Costa Mesa, Calif., was in use from January to June of 1986 and served about the same percentage of customers.

Both systems proved the viability of image processing, but they were replaced in 1987 by IBM's more massive MVS/ESA ImagePlus system. At the time, the USAA and IBM seemed unlikely project partners in image processing; at the time, IBM didn't even have an imaging product to sell.

The Giant Awakens

Big Blue's entry into commercial imaging had a lot to do with the USAA's ambitious plans. By early 1987, the USAA was ready to implement image processing on a large scale, and the firm requested proposals from nine companies.

One requirement of the USAA's proposal process was that the selected system already be, or have the potential to become, a standard product, says Charles A. Plesums, director of image systems at the USAA. If the firm needed a part, or combination of parts for the system, Plesums wanted to be able to draw on an existing inventory. Anything the USAA needed, he reasoned, should be readily available from a salesperson.

☐ CUSTOMERS DEAL DIRECTLY WITH THE HOME OFFICE FOR THEIR TRANSACTIONS.

After the USAA issued its requirements, IBM put together a system proposal that cleared the hurdle of standard components, says Robert Cole, MVS ImagePlus market development manager at IBM in White Plains, N.Y. According to Cole, IBM took known hardware and software entities and assembled the kind of system that the USAA wanted. Part of that software included code that IBM purchased from the USAA. This software had managed the hierarchical filing of image folders used in the earlier FileNet test system.

Needless to say, IBM was eventually selected as the winner. "It was an easy choice. [IBM] was the best technically and financially," Plesums says.

The USAA first approached IBM about imaging in 1982, but Big Blue dismissed the technology as not practical. "But, by the time we actually did go out for a bid, the sleeping giant had awakened," says Plesums. IBM's marketing arm had gotten the message that image processing was ready to go commercial. The technology had been investigated within IBM's labs since the early 1970s and was well understood by the company.

Trading Ideas

Cole says that each of the two companies brought ideas to the table that the other had not considered. IBM, for example, introduced to the USAA the idea of storing images centrally and using standard communications products for distribution to remote sites. The USAA brought to IBM a great deal of information on the characteristics that a heavily used, working imaging system should have.

As for the implementation, IBM was able to finish the project on schedule and within budget, despite the considerable technical challenges associated with developing for a new platform with heavy, on-going user involvement.

Now that the MVS/ESA ImagePlus system at the USAA has established a track record, the USAA sees the benefits boiling down to cost savings, improved productivity and improved service. Plesums says the total annual cost for implementing, operating and maintaining the USAA image system—or any large-scale image system, for that matter—is about $5,000 per terminal. He quotes the typical direct cost savings in the range of $2,500 to $5,000 per user, per year, depending on how paper intensive a company is. Those savings are realized by eliminating such things as file cabinets, file folders, file clerks, delivery clerks and mail clerks, says Plesums.

Thanks to the LRSP, the USAA had already eliminated a lot of its paperwork, so it was looking at the lower $2,500 figure. "It would be pretty hard to put a $5,000-per-year terminal on somebody's desk when the savings are only about $2,500," says Plesums. At the USAA, two users share each terminal.

Besides the savings associated with paper and related costs, the USAA also factors in savings attributed to higher worker productivity. According to USAA studies, the system saves the company approximately $1 million for every one percentage point gain in productivity. Because departmental managers are reporting productivity gains of between 2 and

When Optical Storage Courts Danger

United Servies Automobile Association employees routinely destroy more than 99% of the original paper documents they scan into the company's image-based insurance system. The only papers they don't obliterate are certain legal documents such as titles to cars and papers that show power of attorney. Every other form of correspondence—even post office receipts—are no longer saved.

A bold move? Perhaps, says Louis Olenick, a specialist in computer law and a partner at Olenick and Yarnell in New York. According to Olenick, the USAA is relying on the best available evidence rule in deeming the practice of destroying original documents a proper one. Under the rule, if the original document is available, then it must be entered as evidence in the case of a legal dispute. If the original is destroyed after entry into an imaging system, then the image becomes the best evidence available and the official business record.

Imaging is the third wave of electronic data. The first was microfilm; the second, computers; and now there is optical storage. The law eventually embraced the technology in the first two waves, says Olenick. However, it is still too early in the game for optical storage. "There is a risk that the courts will not accept an image document. Image is at the cutting edge right now," he says. In the meantime Olenick outlines three common sense approaches to using images.

1. Consider keeping the paper originals. Unless it's absolutely clear that you can introduce into court image documents in exactly the same way that you would introduce the paper originals, then consider keeping the originals around, perhaps stored off site.

2. Be aware that the courts will ask about image security. What are the procedures for getting data into the system? Who has access to the data? Could they be changed? Is it the right document? "You may have to have somebody knowledgeable who can describe all that in court," says Olenick.

3. Remember that the courts will be more likely to accept nonerasable or nonalterable optical technology rather than erasable systems. According to Olenick, the federal courts have ruled that companies can introduce electronic records. Yet the wording of earlier court decisions has been vague, referring to "electronic computer storage" but not to optical storage in particular. Most attorneys would advise that until this is clarified, some doubt remains about the legal validity of documents stored on optical media. Says Olenick: "It has not been put to the test."

10%, Plesums figures that 5% is a good conservative figure to use.

With 2,000 workers using the system now, a 5% boost in productivity is roughly equivalent to 100 people. Considering that the USAA's imaging work force consists of salaried professionals with annual benefits and overhead costs running at about $50,000 per person, the yearly savings attributed to higher productivity come out to be $5 million, says Plesums.

Holdover, a measure of backlog of work, is another tool the USAA uses to gauge worker productivity. Holdover used to be counted manually, but the imaging system can report on holdover up to the minute. Although the USAA has not quantified the exact extent of holdover reduction due to imaging, Linda Clay, a senior policy service representative at the USAA, has noticed a definite improvement. "Holdover is a lot less since we started [image processing]," she says.

Wedding Imaging to IS

Before getting its image-processing system up and running, the USAA did confront several technical challenges, not the least of which was deciding how the new imaging system would work with the company's existing IS operation. Plesums says that true technical integration of imaging systems and the Automated Insurance Environment system was simply not feasible.

☐ THE CEO WANTED THE USAA TRANSFORMED INTO A COMPLETELY PAPERLESS COMPANY.

"Visualize the problem," says Plesums. "I'm supposed to go to management and say, 'We've got this neat, new technology and would like to integrate it into our existing program. So why don't you stop this long-range system plan? That way we can rewrite all the programs so we can try this new technology—which no one else is using.' "

Plesums took a more practical approach. The AIE was already designed to deal efficiently with most matters associated with customer letters and correspondence. Yet the USAA had no practical way for its work force to actually see the hard copy when it was most needed—like when a customer was on the phone following up on an obscure written request from the week before. So the USAA implemented the system by setting up separate imaging terminals alongside existing AIE terminals. Today both the AIE and image systems work well together, even though they are not truly integrated.

The USAA soon discovered that imaging forced a number of other system changes throughout the organization. The way the company handles mail, for example, changed radically. A machine opens the envelopes and a clerk extracts and arranges the pages. The mail then moves to a mail analyst who identifies the customer in the computer and determines the mail routing.

The Mail Analyst's New Routine

Before the imaging system was put in place, the mail analyst would write the routing information onto the letter. Now, the analyst enters an IMS indexing number into the transaction processing system using a code that describes the document. A terminal then presents to the analyst the known data about the document, such as date received, customer, description and routing information. The mail is then scanned into the imaging system and is identified by a client number. Thus, the imaging system compiles a complete index of all available documents.

Most users find the new imaging system easier to work with than the old paper-clogged system. According to service representative Clay, all users have their own data terminals and share imaging terminals as they need them. "It's really no problem," says Clay. "It was a lot of hassle having to open mail and sort it. This way, when it comes into our units it has already been sorted. That piece of mail becomes a permanent piece in our system, and it very seldom gets lost."

Learning How to Ask

Training specialist Cornelia Flores, the first image-processing trainer at the USAA, wrote a handbook for users. She agrees with Clay that most workers find the system easy to use. "After I show the user how to ask for the document on the IMS terminal, the first impression they usually get is 'This is fantastic.' You ask for a document and it comes in anywhere from five to 20 seconds," says Flores.

Flores admits that some users have difficulty learning the maintenance and routing functions of the system. Those functions require users to remember the most choices and elements.

Although there is much to admire and learn from the USAA's image application, it is important to remember that the USAA was the forum through which IBM developed, prototyped and introduced its ImagePlus MVS/ESA product. So says Scott McCready, director of image management technology services at International Data Corp. in Framingham, Mass. "USAA is IBM's showcase," says McCready. "When you have a showcase, it should be fairly representative of what you can do for another customer. But USAA is not a representative solution."

The USAA's unique customer service structure sets the firm apart from most insurance companies, says McCready. Because it sells directly to customers, the USAA's policy types are not typical. Consequently, most other insurance companies have different needs than the USAA. In addition, potential users of image-processing systems should realize that success is possible on a much smaller scale.

Another aspect of the USAA that sets it apart from others is the extent of IBM's involvement in the project. "IBM learned about image [processing] on the job and dedicated an incredible amount of human and other resources to doing that job right," says McCready. Other firms may be hard pressed to find similar vendor involvement.

McCready advises IS managers in companies contemplating imaging to take a cue from the USAA and solicit senior management support from the beginning. He says the USAA's accomplishments in image processing could never have happened without the support, encouragement and technical savvy of its senior management. "Unless you have senior management completely behind you, you are wasting a lot of time," McGready says.

> ☐ **By The Time We Actually Did Go Out For A Bid, The Sleeping Giant Had Awakened.**

An Image for Tomorrow

Time is something that the USAA can play to its advantage. The USAA went into image processing anticipating productivity gains and work flow improvements. With those already realized, the company is still waiting and watching to discover advantages it didn't expect. "There is a lot of serendipity in the use of [imaging]," explains Lasher. "When you bring the technology into the business place, you begin to discover all kinds of neat things." For example, Lasher sees the imaging system as an ideal foundation for an enterprisewide bulletin board.

With a successful track record behind it, the USAA is looking at expanding the use of image processing beyond P&C claims processing. Other areas being considered for the technology are the company's life insurance business and the credit card operation, located in Tulsa, Okla.

Of course, in its heavily researched and methodical way, the USAA will proceed on these plans only if the benefits of image processing continue to accrue. Then the company will implement imaging systems application by application as it deems them cost effective.

Emily Leinfuss is a freelance writer based in Sarasota, Fla.

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Why IS Execs Feel Left Out Of Big Decisions

If this is truly the age of the chief information officer, why do so many IS executives feel left out of the corporate planning process? This recent IS survey suggests some answers.

BY GERALD L. HERSHEY AND JOHN L. EATMAN

Top IS executives typically agree that they should be involved in the development of overall business plans for their firms. This opinion is usually backed up by consultants and survey results stressing that IS executives must be part of the corporate planning team if the systems they develop are to serve organizational strategy.

Many have also argued that the manager in charge of a firm's information systems should have a planning role in the organization similar to that of other top-level functional executives in such areas as marketing, production and finance. Such a role might typically carry a title of vice president of IS or chief information officer (CIO). The top executive would then, the argument goes, be actively involved in corporate strategic planning.

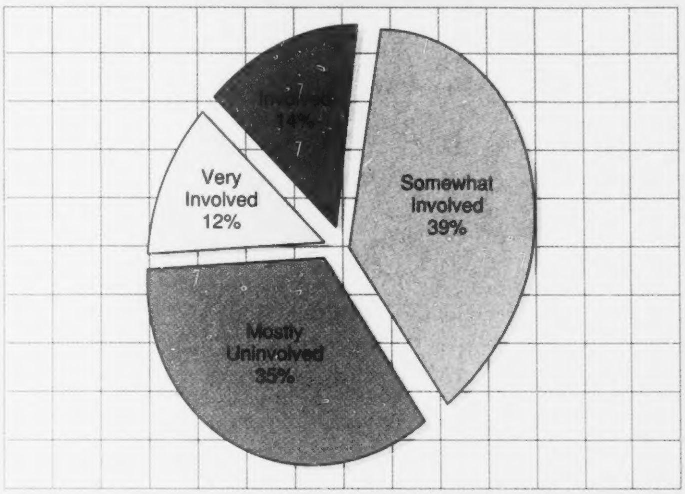
But, years after the introduction of the CIO concept, relatively few IS executives have reached the top echelons of corporate management. Few participate in corporate planning, and many are asking questions. Do IS executives with titles positioning them higher up the corporate hierarchy play more active roles in corporate planning? How well does top operating management understand IS missions and roles? Are there differences in corporate practices or IS management in firms where IS executives are at the top echelons of management compared with firms where the IS executive is at a lower level?

We at the University of North Carolina, Greensboro, attempted to answers these and other questions by surveying the top-level IS executives in 150 of the largest U.S. information systems departments. A total of 58 top IS managers provided responses to the survey.

Despite a few notable exceptions, the answers reinforce earlier studies that have been done on IS management. Yet they also build on these findings by providing some clear guideposts for IS managers to consider as they plan their careers in the 1990s.

Out of the Planning Picture

Relatively few IS executives feel truly involved in corporate planning.



Source: University of North Carolina, Greensboro

As a starting point in the survey, we sought to determine whether IS executives felt they were understood by top management. Respondents were asked to rate on a 5-point scale (5 = a very high level of understanding) the extent to which the organization's top executives were educated about and understood various aspects of information systems. The results were as follows: IS priorities (3.4), IS activities (3.1), IS contributions (3.1), potential IS roles (3.1), IS constraints (2.8), IS personnel needs (2.7).

Understanding IS Practices

The scores show that IS executives do not think that top management in their firms understand IS issues, priorities and practices. If this is true for these very large companies with sophisticated systems and large IS expenditures, IS executives within smaller organizations with much less budgetary clout may have even more trouble signaling their priorities to executives.

We also asked the respondents to highlight those IS issues that consumed most of their time and attention over the past five years. The managers were next asked what they expect to see as major changes for the next five years. (See chart, "Where IS Spends Its Resources.")

☐ **TITLES SEEM TO HAVE LITTLE MEANING WHEN IT COMES TO CORPORATE STRATEGY.**

Although there are some similarities between the two lists, there is a definite difference in focus. On the one hand, support for end-user computing, a major consumer of IS effort over the past few years, doesn't even make the list as an area expected to absorb IS attention during the next five years. On the other hand, there is a noticeably higher orientation in the long term toward building closer links between IS and the firm's business by developing a more business-oriented IS staff and through more support of specialized projects.

The job titles of survey respondents fell into three groups that show the respondents' relative positions in the organizational hierarchy. The top group includes titles such as senior vice president and corporate vice president. The second group encompasses all other vice presidential titles, including vice president of IS. (These two groups comprise 34 executives, or nearly 60% of all respondents.) The third group is made up of senior IS managers with other titles, such as director of IS.

The survey uncovered some interesting details on direct-reporting relationships. Fifteen IS executives report to top operating managers (chief executive officer, chief operating officer, president, chairman and vice chairman), and 19 report to people with titles such as executive vice president and administrative vice president. Thus, a total of 34 respondents—nearly 60%—report to executives with top managerial responsibilities. The remaining 24 IS executives report primarily to executives in the financial area.

No matter who reports to whom, titles seem to have little meaning when it comes to corporate strategy. Despite the fact that nearly 60% of the executives have titles that would seem to reflect substantial involvement in corporate planning, only 27% said they are either "involved" or "very involved," in this area. Another study, conducted by New York City-based Coopers and Lybrand, (See "Careers in Crisis," August 15, 1989 DATAMATION, p.12) shows similar disconnections between IS and business planning; only 20.4% of those respondents feel IS and business planning are integrated.

What makes such low figures even more astounding is that these managers are from the 150 firms with the largest IS investments in the nation. Clearly, title alone is no assurance of heavy involvement in planning corporate strategy and direction. Therefore, simply elevating the title of the IS executive may not change the place that IS holds in the organization.

Where Titles Count

If titles mean little to the organization, they do mean something to the IS executives themselves. IS executives with higher-level titles have a different management focus than those at slightly lower levels. Even though higher level IS execs do not always feel they are adequately involved in the planning process, they tend to be more involved than their colleagues positioned at lower levels.

☐ **PROVIDING EXEMPLARY SERVICE DOES NOT, IN ITSELF, LEAD IS TO THE BOARDROOM.**

The higher the title of the IS exec, the greater the likelihood that the IS department and the firm's management place a high emphasis on cost control. It is probably not surprising, therefore, that these top IS execs are more likely than their colleagues with lower titles to point to ongoing efforts to control costs over the last five years. At the same time, however, the top IS execs are more likely to lobby for a higher percentage of revenues to be directed toward IS activities, and the companies they work for typically have IS budgets representing a higher percentage of corporate revenues than do those of the other respondents.

Top IS executives who report to top-level officers are also much more likely to involve the human resources department in recruiting and training IS staff. And they are very likely to emphasize the competitive positioning of IS and to seek out strong executive support for IS within their organizations.

Where IS Is Involved in Planning

Certain characteristics of both the IS department and the companies they are part of can increase the chances of IS participation in business planning. We found several strong correlations between involvement with business planning and situations in which:

- The firm tends to lean toward centralized management and is highly structured.
- The firm places heavy emphasis on long-range planning.

☐ IS EXECS WITH HIGHER-LEVEL TITLES HAVE A DIFFERENT MANAGEMENT FOCUS.

- The IS executive feels a high level of top management support for information systems.
- The IS unit has a clear mission in the company.
- The IS executive emphasizes competitive positioning of IS and the planning of systems to fit business expansion plans.
- The IS unit develops and uses a strategic plan for IS.

In indicating that more decentralized and less structured companies are not as likely to include IS executives in business strategic business planning, the study contradicts suggestions reported by Thomas Lodahl and Kay Lewis Redditt in their report "Aiming IS at Business Targets," (February 15, 1989 DATAMATION, p. 93). Instead, the picture that emerges suggests that firms with more centralized management, clear structure and missions, and emphasis on long-range planning are more likely to involve top-level IS executives in overall business planning.

In short, these results portray a highly structured organization that can be summarized by the following model:

Where IS Spends Its Resources

When asked where they directed their time over the last few years—and where they plan to focus in the 1990s—IS professionals ranked these items on the top of their lists.

Top Concerns for 1985-1990

- Support end-user computing (44%)
- Use of IS for strategic purposes (42%)
- Control IS costs (34%)
- Connect IS to business plans (31%)
- Plan for integration of IS (29%)

Top Concerns for 1990-1995

- Need for business-oriented staff (51%)
- Increased interaction with users (45%)
- Better understanding of business missions/projects (45%)
- More support of specialized projects/systems (39%)

Source: University of North Carolina, Greensboro

IS executives most heavily involved in corporate business planning are ones who report to very high-level superiors, have high-level job titles, operate in centralized organizations, emphasize cost control, watch over reasonably large IS budgets (as a percentage of revenues), focus on long-range and strategic issues, adopt a corporate perspective and use other corporate services such as the human resources department.

In many ways, this company model is the antithesis of what many IS managers expected in the past: the classic high-growth company, the IS unit that operates as a profit center, or the highly decentralized holding company. Although no one factor can be singled out as the key to IS involvement in corporate planning, an organization that doesn't have a clear understanding of the roles played by its individual departments is less likely to include IS—and perhaps other service units—in its strategic planning.

How Top Managers View IS

How the company assesses IS performance plays an important role in determining how much influence IS executives have in business planning, our survey reveals. IS executives have a greater role in forming strategic decisions in companies whose top management takes into account the following criteria to evaluate IS:

- The amount of value added by IS,
- The importance of developing innovative and strategic IS applications,
- The usefulness of IS in decision making.

The survey findings also indicate that when IS executives are more heavily involved in overall business planning, top management becomes more attentive to strategic and value-added applications of IS. But selling top management on the strategic uses of IS requires direct and meaningful connection to the corporate planning team. Unless the IS function achieves a high level of involvement in business planning, the evaluation of IS by top management tends to remain more like that of a secondary service function.

Good Deeds Are Not Enough

Two other criteria that many IS executives consider extremely important to their careers surprisingly did not correlate in any significant way with the level of IS executive involvement in overall business planning. These criteria are user satisfaction (rated "extremely important" by the respondents more often than any other criterion) and the usefulness and quality of outputs from IS (rated "extremely important" second most often of all criteria). These findings suggest that merely providing exemplary service does not, in itself, guarantee a role for the IS executive in business planning.

Overall, the survey provides clear evidence that the role of IS within a firm is linked closely with the role of the senior IS manager. If the IS manager is unable to contribute to the overall planning process, that manager is not apt to see the IS function as closely linked to the organization. He or she is not likely to see that IS helps the organization reach its corporate goals.

Without a connection between IS executives and top functional executives in the organization, it seems doubtful that IS managers will be asked to play meaningful roles in overall business planning—roles that are becoming increasingly needed to sell the importance of IS to the overall business mission. ▭

☐ TOP IS EXECS ARE LIKELY TO EMPHASIZE THE COMPETITIVE POSITIONING OF IS.

Gerald L. Hershey is professor and John L. Eatman is associate professor at the Joseph M. Bryan School of Business and Economics at the University of North Carolina, Greensboro. Both are involved in research projects examining organizational aspects of information systems.

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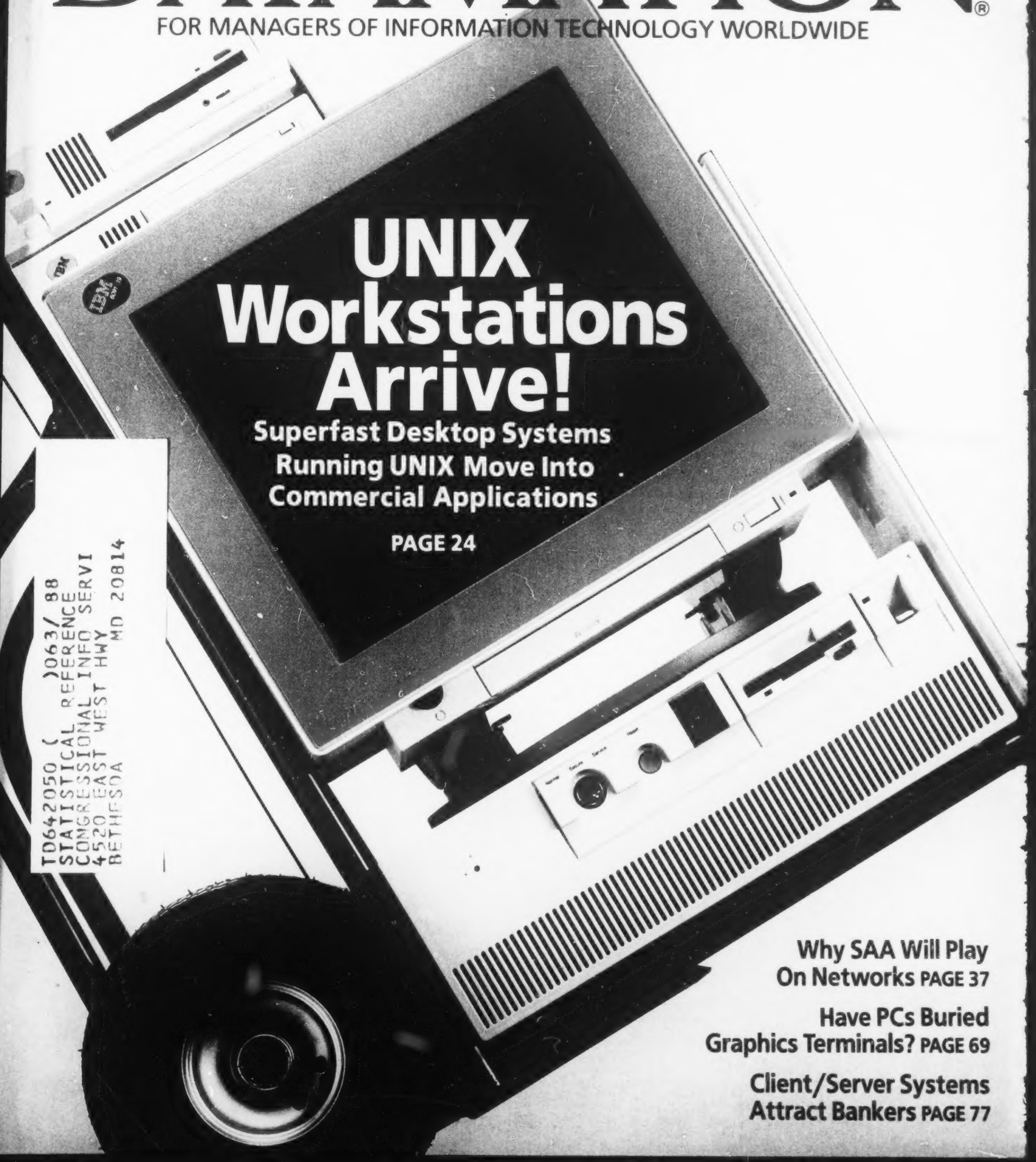

UNIX Workstations Arrive!

Superfast Desktop Systems Running UNIX Move Into Commercial Applications

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UNIX workstations are being rolled out of the lab and into the office.

UNIX Workstations Arrive! 24

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Cover photography by David Bradley

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At Burlington, Open Systems Mean Options At Burlington Coat Factory, director of IS Mike Prince says the attractions of open systems are vendor independence and interoperability across disparate systems.

BY BOB FRANCIS In interviews with DATAMATIONS's Bob Francis, Teflian and Prince discuss what open systems mean to them.

INSIGHTS ON DISTRIBUTED COMPUTING

You have to look at that whole spectrum of things. You cannot look at open systems and have that, in and of itself, be your corporate information facility.

Mark Teflian
Covia Partnership
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We were doing a lot of distributed processing anyway before we committed to the open systems approach. We were doing time sharing, as opposed to batch-type computing.

Mike Prince
Burlington Coat Factory
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People are anxious to derive the benefits of high-speed data transfer beyond local area networks, and the impact on users will be tremendous.

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BY DAVID HEBDITCH The readiness of Eastern European manufacturers to implement new technology implies that the only things holding back rapid automation are the availability of and experience with the technology.

GREAT BRITAIN

Lloyd's Ups the Ante For Claims Processing 115

BY BORIS SEDACCA By the end of the year, the venerable Lloyd's of London expects to have all of its member businesses using a single network application to process claims.

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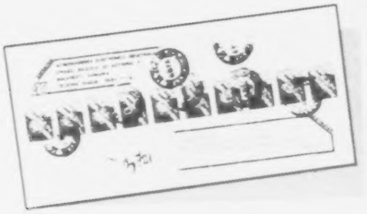

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M. Săndoiu
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—Ed.

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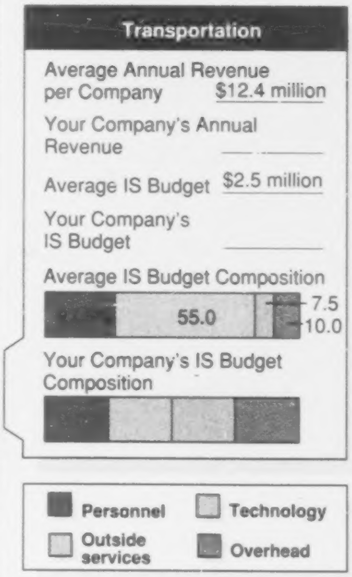
Clarification

Here is the correct data on IS budgets for users in the transportation industry. Our April 1, 1990, story erred in reporting the IS budget figure.



SOURCE: DATAMATION'S 1990 IS SPENDING SURVEY

Those Gears Again

Wrong. The gear arrangement on the January 1990 cover *does* work. Think "speed at the circumference" instead of "gear diameter."

Wolfgang Von Thuelen
Manitoba Data Services
Winnipeg, Canada

Open Consensus

I was pleased to see in "The New Agenda for Open Systems" by Jeff Moad (DATAMATION, April 1, 1990 [p.22]) the recognition that open systems means much more than just UNIX™. The SHARE Engineering/Scientific Workstation Environment Task Force in its Final Report (SHARE SSD #346, February 1986) reached that same conclusion. The task force members constantly fought the battle of people saying, "Oh, you mean UNIX."

There is much more to an open system than just the operating system. To be successful, the entire computing environment, especially the interfaces, must be well defined, open and standardized.

Robert Rosen
Chief
Scientific & Engineering
Automation Office
United States Army
Harry Diamond Laboratories
Adelphi, Md.

ACCESS

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UNIX Workstations Arrive!

IS executives can no longer pass UNIX workstations off as tech toys for the boys in the lab. IBM's entry into the market and the competitive products offered by Digital, DG, HP and Sun make such systems hard to ignore when planning commercial distributed-computing strategies.

BY MICHAEL R. LEIBOWITZ

They're swift and powerful and have barreled into the world's science and engineering labs at a dizzying clip. It's hard to find a chip designer or molecular scientist who doesn't swear by the UNIX workstation sitting on his or her desk. The machines have given these professionals the power to rapidly analyze, visualize and consolidate far-flung pieces of information without getting up from their seats.

But the days of the technical community as the sole preserve for these machines are numbered. It didn't take IBM's announcement of a stunningly powerful line of workstations to convince IS executives that this technology was hot. But the heat certainly was turned up by IBM's products, a line of workstations and servers based on reduced instruction set computing (RISC) architectures and equipped with Big Blue's version of the UNIX operating system.

Just how high the temperature will get in this market is anybody's guess. Commercial sales of workstations worldwide are expected to rise from $900 million this year to $4.1 billion in three years, according to Dataquest Inc. The San Jose market research firm believes the total workstation market will be $16.2 billion in 1993—with a majority of sales ($12.1 billion) still coming from technical applications.

IS executives acknowledge that IBM's all-out entry into the RISC workstation business—it had half entered the market with its RT line of personal computers some years ago—has done something that all the technological advances and the few commercial UNIX applications to date have not: it has made UNIX workstations an accepted member of the commercial computing establishment.

"It sent a signal to some of the people high up in data processing that yes, in fact, this is the future of computing," says Judy Bond, assistant vice president of information services at Blue Cross and Blue Shield of Kansas City (Missouri). "We believe that UNIX is going to be something like water seeping into the basement," adds Wayne Garner, manager of planning and technology development for information systems at The Dow Chemical Co.

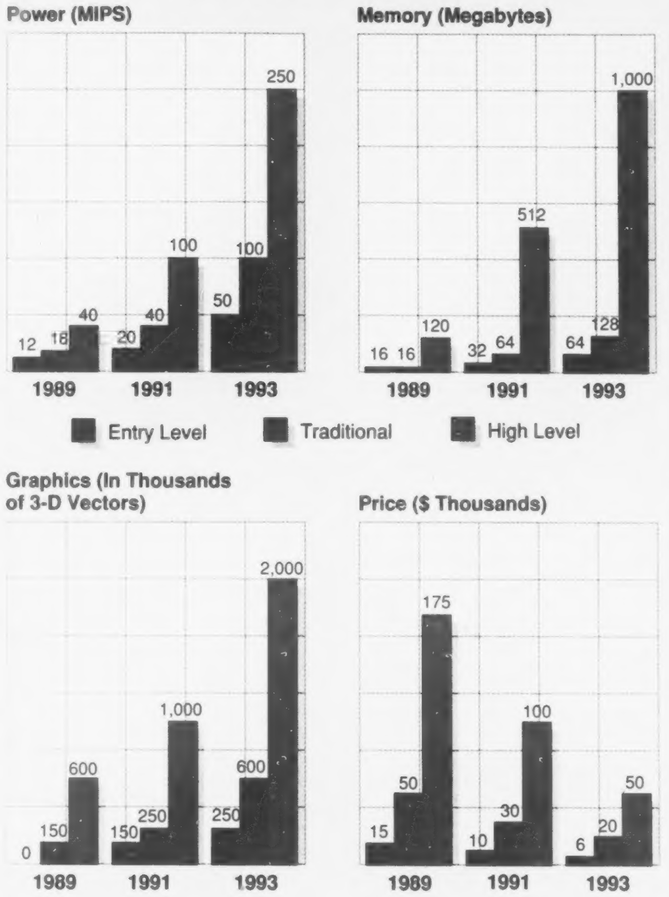
The basement—the entire foundation in many respects—of most users' computing architectures is undergoing rapid change as it is. Most companies and institutions are embracing the client/server model of distributed computing—one made possible by advances in microprocessors, operating systems and networking. They're not totally abandoning their host-based architectures of the past as much as expanding on such designs to take advantage of ever more powerful desktop systems. UNIX workstations fit the bill, competing with personal computers running MS-DOS or OS/2 operating systems.

Where Users Win Big

Users seem to be in a win-win situation vis-à-vis UNIX workstations after IBM's introduction. One obvious win: competition. Just when suppliers of PCs with powerful microprocessors such as Intel Corp.'s 80386/80486 chips or Motorola Inc.'s 68030/68040 chips thought it was safe to demand higher profit margins on their products than they did when hawking 80286- and 68020-based systems, along comes the UNIX workstation gang. Another win: IBM's announcement rivets the attention of independent software developers, whose products will eventually determine whether UNIX workstations make it in the commercial world. Not that such developers had ignored the market—Sun Microsystems Inc. already boasts of more than 2,000 software products available for its SPARCstation family of systems.

Where Is Workstation Performance Headed?

You haven't seen anything yet in the UNIX workstation field.



Source: Dataquest Inc.

The big win, however, is in performance. The bang for the buck on these boxes is hard to beat. IBM's RS/6000 POWERstation 320 offers 27.5 million instruction per second of performance for $12,995—that's $473 per MIPS, workstation fans. Digital Equipment Corp.'s 5000 family of workstations starts at $14,995 for 24MIPS ($625 per MIPS). Hewlett-Packard Co., which continues to blitz the market with new products, now offers a 12MIPS UNIX workstation for as low as $8,995 ($750 per MIPS). Even Data General Corp., which many critics had dismissed as a forgotten minicomputer supplier, has flexed its muscle in this market. DG's Aviion workstations, based on Motorola's 88000 RISC chips, start with the AV400 workstations, offering 17MIPS performance for $9,500 ($559 per MIPS). And Sun, which started this whole round of price/performance one-upmanship a year ago with its SPARCstation announcements, is expected any day now to leapfrog everybody else once again.

That's just the beginning. The future in UNIX workstation pricing and competition holds even bigger bargains. Margins on these systems will be squeezed even tighter and products developed even faster as HP, Sun and the others cope with IBM's entrance. Dataquest predicts users will be able to buy low-end workstations offering 20 to 50MIPS performance for $2,000 to $6,000 apiece by 1993. That's $100 to $120 for every million instructions per second of power.

But bargain prices also give IS executives cause to worry: Will their chief workstation supplier make enough profit to survive beyond the current product cycle? Some say there could be casualties among companies such as MIPS Computer Systems Inc., Next Inc., Silicon Graphics Computer Systems Inc. and others. "They [competitors like IBM] have stepped up the price competition significantly," says Joseph Kubat, vice president of floor networks and microprocessor systems at Securities Industry Automation Corp. (SIAC), a subsidiary of the New York Stock Exchange (NYCE). "I think a company like Sun—or almost anyone in the workstation niche—is going to be under a lot of pressure."

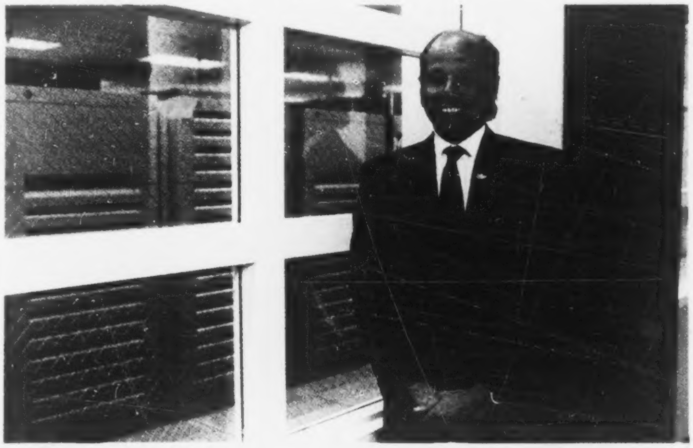
Sun, in fact, is the supplier most users and analysts mention when the issue of financial resources surfaces. To no one's surprise, the Mountain View, Calif., company had been burning up cash to fuel its heady growth. Some thought the company had overheated a year ago when a product transition and internal IS problems stymied quarterly growth and sapped profits. But Sun's steady track record since the second quarter of 1989 has removed a lot of those doubts.

"We've been operating at gross margins in the 40 to 50% range for some time," says Edward Zander, vice president of corporate marketing at Sun. His company finished 1989 with greater than $2 billion in revenues and $36 million in earnings. With revenues approaching $200,000 per employee, he argues, Sun is so productive that it can withstand some erosion of margins and still remain profitable.

Sun and others may indeed have their mettle tested if IBM lives up to its intention of being No. 1 in the workstation market. As farfetched a goal as that seems to many, it could wreak havoc with the balance sheets of its competitors. "I don't think IBM can grow that fast," Dataquest analyst Katheleen Hurley says of IBM's intention to capture a 30% market share—and the lead—by 1993. At best, she believes, IBM will command 15% of the market in three years—still far greater than its current portion, which amounts to barely 2% of the $6.1 billion in world workstation sales. According to Dataquest's figures, Sun (at 28%) and HP (with 26%) are currently neck in neck for market leadership, with Digital (at 20%) following close behind.

A company like Sun—or almost anyone in the workstation niche—is going to be under a lot of pressure.

Despite such leads in the market, few of those or any other workstation competitors will be able to escape the financial pressures created by IBM's new thrust in workstations. Most industry experts believe competitors will cut prices further to close deals before IBM starts shipping its RS/6000 in volume. Suppliers of workstations already are notorious discounters. For example, users surveyed last fall by DATAMATION and Cowen & Co. reported receiving nearly 18% in price concessions when last purchasing workstations. Sun was offering the best deals—slashing prices 21%. Digital was discounting 17% and HP 16%, according to those responding to the survey.


SUN'S ZANDER: Sun is so productive it can withstand some margin erosion.

Photograph by Robert Foothorap/Black Star

IBM pulled no punches in its introduction of the nine UNIX-based workstations and servers that make up its RISC System/6000 family. Built around a set of advanced, internally developed RISC processors and coprocessors, the new family instantly put IBM out in front of the pack in terms of price/performance. It also lent IBM's support to the UNIX movement in general, although the RS/6000 systems do run AIX, the company's proprietary version of the UNIX operating system. The one thing that IBM couldn't give users, ready-to-run applications packages for the new system, it promised by the end of the year. The company says 1,500 applications will be available in 1990. Several thousand applications already are available for DG's, HP's and Sun's workstations—although a majority are for technical, not commercial, users.

"We thought they got it right," Kubat says of IBM's new product family, on which his staff has received a detailed briefing by the supplier. "I have people that are kind of hard-nosed with respect to evaluating this kind of announcement. They've, to a man, come back impressed."

What's impressing most IS executives about UNIX workstations isn't so much their current functionality as their future potential. In particular, they foresee a vast amount of packaged commercial software being developed for such systems beyond what already exists. Shrink-wrapped software, in fact, is one of the reasons Kubat's shop is planning to use UNIX workstations. SIAC will soon begin evaluating workstations to display, record and analyze data for use by trading specialists on the floor of the NYSE.

Declaring Vendor Independence

SIAC and other users also are jazzed about the potential for UNIX workstations to free them—and their homegrown applications—from being locked into one set of hardware. "If you use a proprietary operating system, you're gated by that vendor's internal priorities," Kubat says. He's confident that most UNIX suppliers will be able to embellish the operating system sufficiently to add value to specific applications and thereby differentiate themselves.

At Wal-Mart Stores Inc. in Bentonville, Ark., freedom is the main reason behind the company's decision to adopt UNIX workstations for a new 1,600-unit in-store system. "We went to UNIX because we wanted something that would make our code portable across different platforms," says Mark Schmidt, senior director of information services at Wal-Mart. Portability allows users to develop applications for one type of UNIX hardware platform and run it on another as long as the suppliers of each

Why UNIX Isn't for Everybody

Although IBM's entry into the UNIX workstation market is making a mark for all such systems in commercial applications, not all commercial users plan to use them. For some, there simply is little reason to change.

"We can't stop every time vendors pull rabbits out of the hat and change our plan," says Mike Schuckman, manager of information services at BHP Petroleum Americas Inc. His Houston company already had standardized on a two-platform computing architecture—IBM for commercial applications, Digital Equipment Corp. for technical matters—when IBM unveiled the RS/6000.

"UNIX-based machines would have to make a pretty compelling argument for me to want to change something that I already have," says Jim Hall, vice president of information services at New York City-based Sterling Drug Inc. He's content, for now, with his ability to distribute applications across an IBM 3090 and assorted IBM midrange machines, including several AS/400s.

"For us to just drop everything and change our strategy because of this [RS/6000] announcement, that's just not going to happen," says Harry Wallaesa, vice president of management information systems at Campbell Soup Co. in Camden, N.J. UNIX workstations represent a potential competitor to PCs for Wallaesa, who presides over a highly distributed computing environment, which includes 150 AS/400s, 2,000 PCs and an IBM 3090 mainframe.

The big question for Wallaesa in determining Campbell's workstation recipe in the future is how the competition between the UNIX and OS/2 operating systems is going to play out. "I guess what we're doing is seeing whether there are advantages to using a very powerful UNIX box, as opposed to a very powerful OS/2 box," he says.

The big win for users is in pricing. The bang for the buck on these boxes is hard to beat.

adhere to the same sets of operating systems standards.

Wal-Mart is testing an RS/6000 system, hoping to replace the IBM series 1 minicomputers currently in use at each store. Each RS/6000 unit will run up to 10 ASCII display stations, connect to point-of-sale controllers and run the store's back office. The company plans to roll the systems out to its stores this summer.

For other users, price/performance, not standards, is the dominant attraction of UNIX workstations. New York Life Insurance Co. in Manhattan, for example, is currently testing three of the new RS/6000s for a system that would move applications such as underwriting from central mainframes to workstations in the field. "It will allow us to do a lot of additional functions . . . right at the point of entry, rather than doing them on a host-based system and, in some cases, in batch mode," explains Tom Pettibone, senior vice president of information systems at New York Life. If the test is successful, New York Life will purchase as many as 1,000 RS/6000s before the end of the year.

The pace of price/performance improvements made to these systems only stands to quicken with IBM in the market, many IS executives believe. Although each of IBM's major workstation competitors denies that it has moved up product introduction schedules in response to Big Blue, at least one important customer thinks otherwise. "Their plans haven't changed, but it appears to me they're trying to accelerate them," says Don Smith, computing strategy manager for Texas Instruments Inc.'s Design Automation Division, a big user of workstations. Each of TI's UNIX workstation suppliers has been clamoring to meet with Smith and another TI executive to reassure them of their intentions to combat IBM.

But regardless of whether IBM maintains its lead in workstation price/performance or loses it to Sun or another competitor, the $63 billion computer maker has some natural advantages in attracting commercial customers to the RS/6000. The biggest defies measurement. It's called familiarity. "As a company, we've had a long-standing relationship with IBM. There's reasons to want to continue that," says New York Life's Pettibone. He's particularly assured by IBM's promise to provide additional capabilities to AIX that will help RS/6000 systems share data with computers conforming with IBM's Systems Application Architecture (370 mainfames, AS/400 midrange systems and PS/2 desktop systems).

While IS executives at Wal-Mart won't say whether IBM has a built-in advantage in a competition with Hewlett-Packard for the chain's lucrative workstation business, they do acknowledge that Big Blue is the incumbent supplier.

And even in the technical world, in which IBM has traditionally not been a major player, the company's entrance could have a significant impact. "They have an advantage in that they're a big company,"

SIAC'S KUBAT: Price competition has increased significantly.

Photograph by Jill Levine

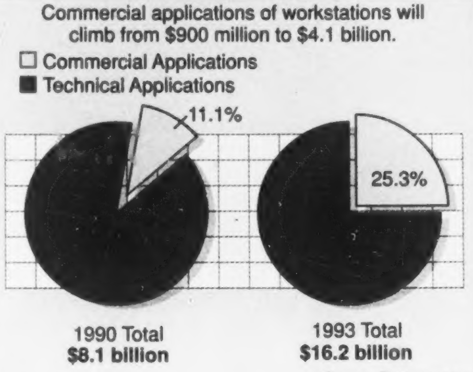
One of the big barriers to using the new UNIX workstations will be the fact that commercial COBOL applications are so difficult to port, says George Weiss, an analyst with Gartner Group Inc. of Stamford, Conn. Most applications running on mainframe systems are written in the Common Business-Oriented Language. Porting such applications to run on UNIX platforms is a complex task that requires understanding COBOL variations between the mainframe and workstation environment and having the proper tools to do the job.

Even more challenging is adapting how most mainframe systems store files via the Virtual Storage Access Method (VSAM) to something such as an Oracle Corp. relational database on a workstation. Screen-handling changes must be made, communications protocols must be modified and the interoperability standards of Systems Application Architecture (IBM's computing bluebrint) must be adhered to. "There's a whole lot of stuff I don't think the users are fully equipped to understand or do right now," Weiss says.

Some IS executives wouldn't even bother trying to fit COBOL-written applications into a UNIX workstation shoe. "Don't give me something that repeats the sins of the past," says Sterling Drug's Hall. If he were sold on workstations, he would scrap existing COBOL applications running on the mainframe and write new ones on workstations with fourth-generation languages.

There's no point in porting mainframe COBOL applications to the new platform, agrees John Collins, vice president of management information systems at Hallmark Cards Inc. in Kansas City, Mo. Applications should be substantially rewritten upon effecting a transition to UNIX workstations to make them every bit as flexible as the market demands.

Workstations Take Off Commercially



Source: Dataquest Inc.

says Texas Instrument's Smith. "If they are in fact committed to a workstation strategy and a family of products, I think that carries a lot of weight. When IBM first came out with its PCs, all of a sudden it was a de facto standard. That potential, in my opinion, exists again."

New vs. Old Applications

There are, however, some technical impediments to UNIX workstations achieving the level of commercial success seen in PCs, whether those workstations are made by IBM or anyone else. For some IS executives, there are some big deficiencies that must be addressed before they put their arms around UNIX workstations. Mike Schuckman, manager of information services at BHP Petroleum (Americas) Inc. in Houston, says communications to his current systems—notably four Digital VAX minicomputers and three VAX workstations—is required of any new platform. "What we're not sure of yet is how the UNIX boxes are going to work with our VMS environment," says Schuckman, in reference to the operating system running on those VAXs. "We certainly heard that it could be done. We're being careful and waiting for other people to get some experiences there."

"IBM doesn't quite have all the pieces yet," agrees Bond at Blue Cross. One missing piece, she says, is a suitable way to update workstations on a network as new software releases become available. Nevertheless, the RS/6000 already is having an effect on Blue Cross' IS plans. The user has deferred redesigning some applications currently running on mainframe systems until it sees whether UNIX and workstation computing develop as industry standards. "If I was to redesign them right now, they'd be wrong," Bond says. "I might write another CICS [Customer Information Control System] application on the mainframe, and that's just not the way things are going to go."

For Bond, the route to using powerful UNIX workstations, which Blue Cross may embark on within the next several years, will involve first trying them on a small but important application such as a managed care reporting system. Bigger applications will follow as the user grows familiar with UNIX. But it will be a slow process. "I think that's the way we're going to go before I retire," Bond says, referring to her desire to someday move all applications to desktop systems. "But I don't think it's going to be tomorrow." ▭

Michael R. Leibowitz is a business writer in the San Francisco Bay area.

What Do You Think About UNIX Workstations?

Let us know your answers by circling the appropriate number on our reader service card.

Before IBM's announcement, were you seriously considering the UNIX workstations as a platform for commercial applications before January 1990?

YES Circle 101 **NO Circle 102**

After IBM's announcement, are you considering UNIX workstations for commercial use?

YES Circle 103 **NO Circle 104**

If yes, which supplier or suppliers are you most likely to do business with? And on which do you desire more information?

	BUSINESS WITH	MORE INFORMATION
Apple	**Circle 105**	**Circle 106**
Data General	**Circle 107**	**Circle 108**
Digital	**Circle 109**	**Circle 110**
HP	**Circle 111**	**Circle 112**
IBM	**Circle 113**	**Circle 114**
MIPS Computer	**Circle 115**	**Circle 116**
Next	**Circle 117**	**Circle 118**
PC makers	**Circle 119**	**Circle 120**
Silicon Graphics	**Circle 121**	**Circle 122**
Sun	**Circle 123**	**Circle 124**
Unisys	**Circle 125**	**Circle 126**

If no, why aren't you interested in UNIX workstations?

- Happy with existing systems. **Circle 127**
- Waiting for single, nonproprietary UNIX to emerge. **Circle 128**
- Plan to put future applications on PC platforms and operating systems—e.g. Macintosh, MS-DOS, OS/2. **Circle 129**
- Too few commercial software applications packages. **Circle 130**
- Lack of human IS resources, e.g. programmers, to manage them. **Circle 131**

Human Resources: A Strategic Partner Or IS Burden?

Once an administrative backwater, Human Resources now claims it has a strategic role to play—and it's demanding a higher level of IS support. But the size of the payoff remains to be seen.

BY DAVID STAMPS

The vice president of Human Resources is not unlike the VP of Information Systems. His or her lot in life is basically to support the line business managers and to petition other supporting players, such as IS managers, for a fair share of resources and respect. In the corporate pantheon of stars and heroes, don't expect to find many vice presidents of Human Resources. At least not yet.

Consider the following observation by management guru Tom Peters of *In Search of Excellence* fame. Peters makes a career of bashing middle-management support types such as corporate trainers, accountants and—yes—IS managers. Speaking at a business luncheon several years ago, Peters recommended keeping payroll and employee record-keeping functions far apart. Otherwise, he said, "they'll try to get together and form a Human Resources department."

A New Corporate Contender?

But Human Resources seems to have survived the abuse heaped on it over the years. Indeed, it has done more than survive; 1990 finds HR brushing off its pinstripes and rising up to announce that it intends to play a strategic role in guiding the business enterprise through the anticipated turmoil of the coming decade. As this happens, rest assured that IS will become increasingly drawn into the process.

"For most companies, it is still a new concept, but you're going to see Human Resources being a lot more closely involved in strategic planning," predicts Ron Groess, manager of benefits systems for 3M in St. Paul. Groess is also a member of the Dallas-based Association of Human Resource Systems Professionals (AHRSP), a group of about 3,000 HR managers who serve as a liaison between HR and IS. He cites statistics that HR commonly uses to polish its image: anywhere from 40 to 60% of a company's operating costs are employee related; therefore, management must understand how best to use this expensive resource.

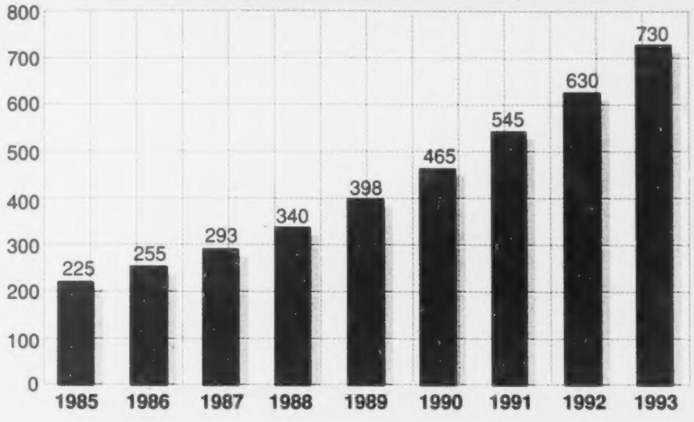
Whether or not HR plays a strategic role, one thing is clear: in the past several years, HR has grown to become a strategic market for a veritable stampede of software vendors and consultants. *Personnel* magazine's most recent directory of HR products and services lists more than 160 companies offering some sort of human resources information systems (HRIS) product. And that's only the tip of the iceberg. AHRSP maintains a vendor list of more than 800 companies, including consultants, that pitch HR management products. That's just about one vendor for every two of AHRSP's 1,500

Illustration by Sandra Filippucci

Capitalizing on the Human Resource

Keeping track of employees is a universal need not lost on the many suppliers of human resource software packages. By 1993, IDC projects that the market for U.S. vendors across all computer platforms will be $730 million.

SALES OF HUMAN RESOURCE SOFTWARE ($ MILLIONS)



Source: International Data Corp.

member firms.

International Data Corp., the Framingham, Mass., industry research firm, expects the yearly market for HR software to nearly double from $398 million last year to $730 million by 1993. And while this figure includes software and maintenance for all platforms, it does not include the sizable HRIS consulting market.

An Attractive Software Market

The growing HRIS software market has attracted the attention of some big name vendors. IBM does not offer a HRIS package per se, but it did join forces this year with Price Waterhouse and San Francisco-based Tesseract Corp., a leading vendor of mainframe-based HR software, in sponsoring a 14-city tour billed as the "Financial and HR Solutions Conference." IBM's part of the show is to tout the ability of its Systems Application Architecture (SAA) and DB2 relational database to support HR applications.

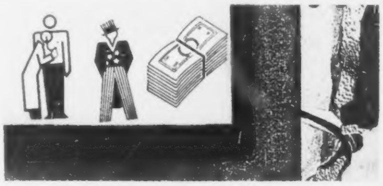
Earlier this year, Oracle Corp. of Belmont, Calif., added an HR management package called Oracle Personnel to its Oracle Financials line of business applications. According to Marc Hebert, Oracle's vice president and chief information officer—who also heads up applications development for Oracle Personnel—the HR package is an integral part of Oracle's applications strategy, even though it followed Oracle's General Ledger and Accounting applications into the market by more than a year. "We began with the strategy that we would offer a family of applications that large companies can use to run their business. We knew that meant a product that would let companies manage their employees."

Dedicating Support to HR

Judging by the size and the amount of market activity in HR software, automating many employee management tasks is indeed a serious activity. Not only are large corporations shelling out anywhere from $500,000 to $750,000 to purchase the latest in integrated HR packages, many firms have formed special IS groups dedicated to supporting HR and nothing else.

"We're just starting to see the HRIS function emerging in the past couple of years," observes Judy Dunnington, specialist with the Hunter Group, an HRIS consulting firm based in Baltimore. "It's not uncommon to find IS giving up anywhere from six to a dozen of its people and transferring them to a hybrid HR/IS group. You walk into the HR/IS department, and it looks and feels like the IS department. Except it isn't, because it reports to HR. Except it is, because it's doing all the things that IS used to do to support Human Resources."

Why is all this happening? A few years ago, when the move to upgrade old batch personnel and payroll systems began in earnest, the answer to that question was perhaps a little simpler than it is today. Then, it was easy to blame the government; the cumulative burden of state, federal and local government-reporting requirements was placing a strain on older batch systems, not to mention IS staff who found themselves perpetually scrambling to keep up with each new reporting demand.



☐ **HR HAS BECOME A STRATEGIC MARKET FOR A VERITABLE STAMPEDE OF SOFTWARE VENDORS.**

Government compliance is still a factor today in the HR systems workload. Just ask any HR professional about Section 89 of the 1986 Tax Reform Act, which requires that companies prove that higher salaried employees are not receiving preferential benefits packages. Section 89 is believed to have prompted several million dollars' worth of software development work, only to be repealed last year just before it was to take effect. But government reporting is no longer the single factor driving HR system upgrades.

A Basket of Benefits

An even bigger issue is the soaring cost of employee benefits. According to the U.S. Chamber of Commerce, the average benefits package now amounts to 37% of an employee's salary (see sidebar, "The Burgeoning Cost of Employee Benefits"). At many companies, the pressing need to gain control over escalating benefits costs is what is really driving Human Resources to the forefront. "The HR function is getting a lot more boardroom attention today than it ever did before. But that's usually a sign of a perceived problem, not perceived leverage," says Bruce Coleman, president and chief executive officer of Information Science Inc., a Montvale, N.J., supplier of HR software.

One way to get a handle on the cost of benefits is to replace batch personnel and payroll systems with new integrated HRIS software—software that is geared to handle flexible, cafeteria-style benefits programs. Under such programs, employees are essentially allotted a fixed dollar amount for benefits and allowed to mix and match from a menu of benefits options. "Whether it's governmental reporting or the need to offer flexible benefits, each brings complexity to HR administration," says Coleman. "Each is driving the need for newer systems and pushing HRIS into a more prominent role."

For those who harbor any doubt that HR's job is more complicated than it used to be, just listen to Dorothy Williams, who has worked in Human Resources for the past 14 years at Sovran Financial Corp. in Norfolk, Va., a company with over 16,000 employees.

"Ten years ago, about the only thing Personnel did for employees was to hire them, give an annual pay raise and terminate them. Once in a while, you might put someone on a leave of absence. Two to three transactions per year per employee was a lot," says Williams. "Today, we have whole new categories of employee classifications—not just full-time and part-time but casual-part-time; prime-time/optimum-hourly, for people who work 30 to 40 hours a week; special job-sharing classifications for people who work 20 hours a week. And people move in and out of these various classifications. Today, eight to 15 transactions per employee is not the least bit unusual."

The On-Line Upgrade

The need to offer flexible work schedules prompted Sovran two years ago to replace its batch personnel and payroll systems with an integrated HR package from Tesseract. Also prompting the move was the need to keep up with changing IS technology, explains Williams, who is now vice president of the newly created HRIS department.

"We needed something that was on line," says Williams. "We're spread out over 13 states today, and it takes too long to send employee information by mail. We needed a system that was date sensitive. With the old system, you could hire an employee, but his papers might not arrive until after a pay period had passed. Then a clerk had to go back and calculate retroactive pay and deductions."

☐ HUMAN RESOURCES SEEMS TO HAVE SURVIVED THE ABUSE.

Most of all, Sovran needed a system that was integrated. Because employee data are connected to so many other applications these days, just trying to enter a new employee's name in every system is an administrative nightmare. "Employee records interface with five different general ledger packages," explains Williams. "We have 50 different incentive plans, 60 different payroll deduc tion plans, 80 different earnings options. We even interface to the system that keeps track of the employee parking garage."

Among all the reasons to upgrade an HRIS system, however, the need to offer flexible benefits stands out. "The buzzwords of the '90s are 'work and family-life considerations,' which translates into more and varied work and payment options," says Williams. "If you don't offer the flexibility that lets people work the hours they want to work, they'll go across town to a competitor who does."

The Bigger Picture

Rohm and Haas, a specialty chemical company in Philadelphia with 12,000 employees, tells a similar story. "We were using a 16-year-old batch system running on an IMS, [IBM's Information Management System, mainframe] database. It was tough to keep the files updated; it was tough to do edits and run reports. Management was having a devil of a time getting up-to-date information," explains Doug Perry, manager of a new group at Rohm and Haas called the Human Resources Information Center. "Then we started to see a proliferation of PC databases; everyone was creating his own database to meet his own needs. There was no single repository where employee data was stored correctly and kept current."

Two years ago, Rohm and Haas' director of HR and the chief financial officer led a move to upgrade the HR systems. The company selected a package from Tesseract and created a 10-person Human Resources Information Center (HRIC) to install and maintain the software. But that was only a first step. By fall of next year, the HRIC will have completed a migration to IBM's DB2 relational database. "The whole project, including system design and migration to DB2, will represent an investment of several million dollars," says Perry.

Technically and architecturally, the direction of the new HRIS follows a couple of established trends in the larger IS arena. One of these is the move to distribute processing across a variety of computing platforms. Although most HR applications have some central database re-

The Burgeoning Cost of Employee Benefits

The cost of employee benefits is one of those good news/bad news stories. Today, the average benefits package equals 37% of a U.S. employee's salary—that's about $10,730 per year for an employee earning $29,000. According to the National Chamber Foundation, the research arm of the U.S. Chamber of Commerce, the average benefits package in 1965 was just 21.5% of a worker's salary. That's the bad news. On the positive side, the pace at which benefit costs are growing in relation to salaries has stabilized. Today, both seem to be growing at equal rates.

Still, the dollar costs of benefits are increasing right along with rising salary levels, points out Martin Lefkowitz, director of special projects for the National Chamber Foundation. Moreover, health care insurance costs continue to escalate. In 1979, employers paid an average of $814 per employee for health and dental insurance. In 1988, the average was $2,052 per employee.

"There's been a big shift in the costs of benefits," says Lefkowitz. "Health costs are the big uncontrollable; they are still going up fast. At the same time, many companies have been able to reduce other benefits costs, such as pensions, by moving to newer and more flexible benefits plans. Older firms may be stuck with high pension costs; newer firms tend not to have defined benefits plans. They have defined contribution plans, such as 401k plans."

Each year, the Chamber surveys benefit expenditures as a service to companies concerned about rising costs. Last year, 10,000 companies purchased copies of the survey in order to compare how they rated against other companies in their industry.

This year, it will be easier for companies to make the comparison, thanks to a PC software package called the Employee Benefits Analyzer. The package, developed by the Chamber in conjunction with Decisions Services Inc. of Stamford, Conn., displays a company's costs on various graphs based on survey results. Comparisons can be made by dollars per employee, percentage of salary, industry, company size and region. It also compares costs for various types of benefits, including health care, pension and vacation, and should be available by early summer.

The Employee Benefits Analyzer is available to all companies, including nonmembers, for $75. Contact the U.S. Chamber of Commerce at (800)-638-6582.

quirements, many are departmental applications serving local needs. "A lot of people who touch HR data aren't daily users of it," says Information Sciences' Coleman. "That's why HR applications need consistent and easy user interfaces across a variety of hardware platforms, and why compliance with a tiered architecture, like SAA, is an important HRIS requirement."

The other IS trend embraced by human resources is the use of relational databases. HR staff are, perhaps, the most prolific users of relational database technology. "No one else finds as many different ways to get at the data as Human Resources," notes Coleman.

This is a polite way of saying that HR has a perpetual need for ad hoc reports that would drive an IS staff around the bend if it had to generate each report from scratch. How many contact lens wearers will be affected by a change in health insurance coverage? How much does the company spend per week on unemployment compensation? How many left-handed, French-speaking engineers does the company employ?

"Human resource applications are a lot different than typical accounting applications, where the numbers change but the report format doesn't," says Alden Briscoe, product manager for Oracle Personnel. "Human Resource departments are constantly coming up with reports for one-time situations—usually a report that was completely unforeseen a week ago, and now all of a sudden they need it yesterday."

A Special Relationship with IS

HR's perpetual need for unexpected, ad hoc reports may be what lies at the heart of the close connection that has developed between HR and IS. These days it's not uncommon to hear statements from IS to the effect that it wants to work more closely with user groups. Yet seldom does such talk translate into a specialized support group. But HRIS departments and HR Information Centers are not at all unusual. "The HRIS function is new, but it's already common among companies with 2,000 or more employees," observes Hunter Group's, Judy Dunnington.

"No other department seems to require the liaison with IS that HR does," confirms Thomas S. Wilson, associate director of IS development at Loyola University of Chicago. "Finance may ask for a model, then ask to have it modified once a year. But HR needs a new report every week."

It is precisely this ad hoc reporting capability that stands to attract top management's attention to the new HRIS systems. "Say, for example, a company is reorganizing, divesting itself of some divisions," hypothesizes Oracle's Briscoe. "Management needs to be able to do simulations: 'If we get rid of this division, what will the demographics of the company look like? What will the salary structure look like?' "

☐ LARGE CORPORATIONS SHELL OUT ANYWHERE FROM $500,000 TO $750,000 FOR THE LATEST HR PACKAGES.

Tomorrow's What-If Scenario

Briscoe sketches another scenario, where HR plays a role in deciding whether a company should proceed with an acquisition or merger. The acquiring company would create ad hoc reports from its employee records and those of the target company to simulate the new entity. Such a simulation could presumably show if there was a complementary fit of the people. Or maybe it would show that the two firms had too much overlap and that the acquiring company would need to lay off many senior executives, who would require expensive severance packages. Maybe the whole acquisition would be scuttled based on information provided by human resources.

Is anything like this actually happening? "Probably not—at least not yet," concedes Sidney H. Simon, a veteran of both IS and HR, who helped found the AHRSP 12 years ago. Now a principal with Alexander & Alexander Consulting Group in Los Angeles, Simon believes that this is exactly the sort of strategic support role that HR ought to be playing. In fact, his firm is working on just such an analysis model.

"There's no technical obstacle to doing this kind of analysis," says Simon. "The limitations lie with the ability and creativity to sell the idea to management. When merger and acquisition decisions are analyzed at the board level, the tendency is to focus on financial issues, financial liabilities, not on people issues. But, in fact, it's people and organizational issues that often cause a merger or acquisition to go sour." ▭

David Stamps is a freelance writer based in Minneapolis.

BANK
MONEY MACHINE
S.Harris

"I tried to withdraw $75, but I got a Dr Pepper instead."

Don't Let Recession Fears Guide You

Your 1990 IS spending plans should probably factor out a recession in the United States. Goods produced by U.S. plants and services rendered by Stateside offices are growing—albeit slowly.

BY MADELINE FRANCHI

Are information systems executives leery about the direction of the U.S. economy this year? You bet. More than a third of executives polled by DATAMATION in its annual IS Budget Survey expect a recession in 1990, and nearly half of those pessimists indicate their spending would be cut as a result, most estimating that a recession would chop 15% off their IS spending plans for 1990.

Executives may not, however, have to reach for the budget-cutting ax. The U.S. economy, although it may be on the brink, is unlikely to fall into the abyss of recession.

The U.S. economy grew 2.9% in 1989, according to the U.S. Commerce Department. The growth in output of goods and services by U.S. producers was in line with Cahners Economics' expectations, leaving its forecasts for this year and next unchanged. The group sees the U.S. economy expanding 2.1% in 1990 and 3.0% in 1991. Cahners believes the U.S. economy has passed through its worst period and is confident that output will grow, albeit slowly, quarter to quarter this year.

Cahners is not alone in that sentiment. Six out of 10 members of the National Association of Business Economists (NABE) panel believe the U.S. economy will avoid a recession over the next three years. Furthermore, the consensus of 51 economists that constitute The Blue Chip Economic Indicators group figure the U.S. gross national product (GNP) will grow at 1.7% in 1990 and 2.4% in 1991.

Mind you, the IS executives who expressed their doubts about the strength of U.S. commerce and industry in 1990 had good reasons to feel that way when DATAMATION polled them at the start of the year. At the time, confusion and uncertainty were the order of the day: economic indicators and interpretations presented conflicting future scenarios.

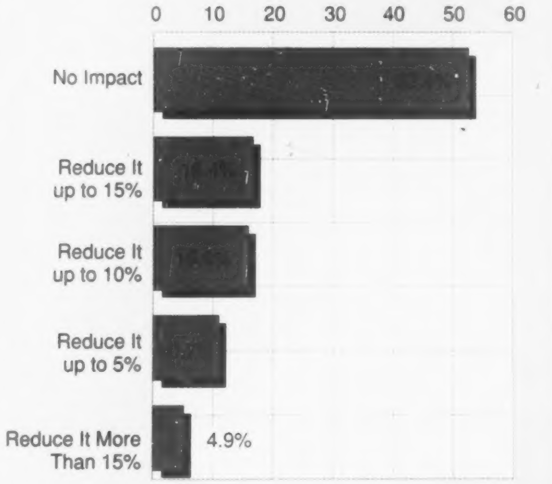
Although the monthly average prime bank rate remained at 10.5% between August and December 1989, other interest rates edged up at a time when economic weakness would have made analysts assume otherwise. Housing starts, another indicator, declined 7% last year—a steeper drop than expected. But it turned out that hurricanes, earthquakes and severely cold weather, more than economic trends, unmercifully hindered construction.

Even now, the risk of recession remains significant. Almost half of the NABE panel of economists believe the risk of a recession increased in the last quarter of 1989. And don't be surprised if you hear a few more disappointing economic numbers for the early part of 1990. Economic signals often waffle and contradict each other around turning points. Yet, all of the shake-ups and uncertainty notwithstanding, Cahners believes the economy will stabilize. ▭

More economic information can be obtained from Cahners Economics Department, 275 Washington Street, Newton, MA 02158, (617)-964-3030.

How a Recession Would Affect IS

More than half the surveyed IS execs believe their IS budgets would remain unscathed by a U.S. recession.

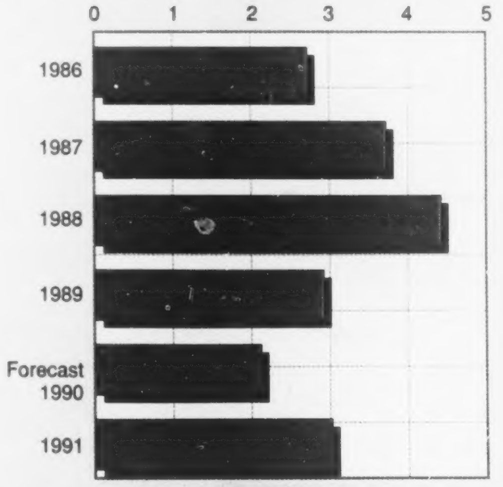


Source: DATAMATION

Where the U.S. Economy Is Headed

Output of goods and services is expanding slowly.

% CHANGE IN GNP (Adjusted for Inflation)



Source: U.S. Commerce Department (data); Cahners Economics (forecasts)

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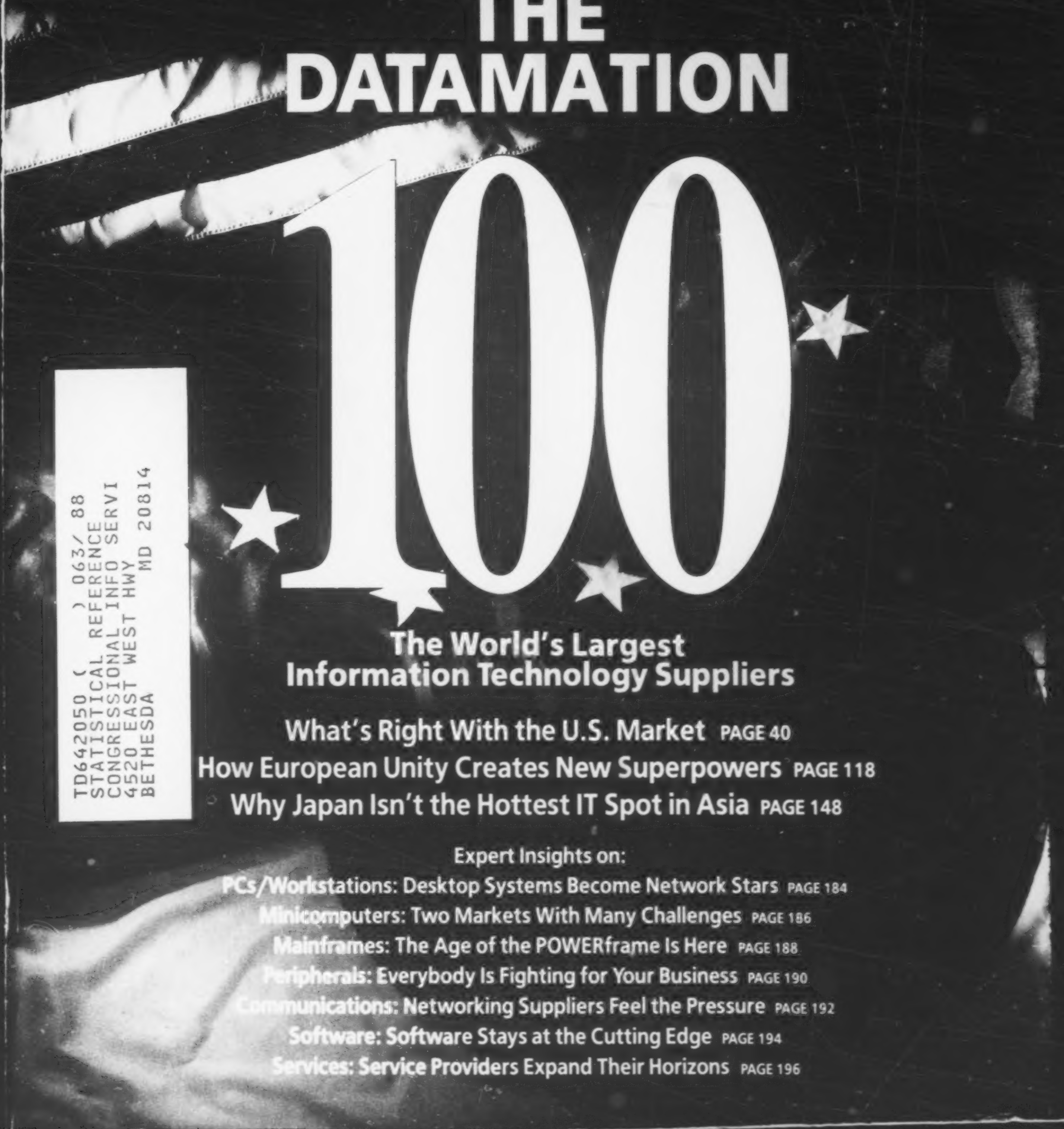

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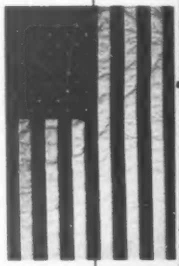

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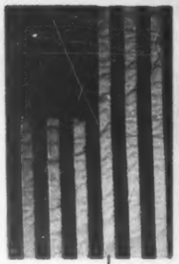

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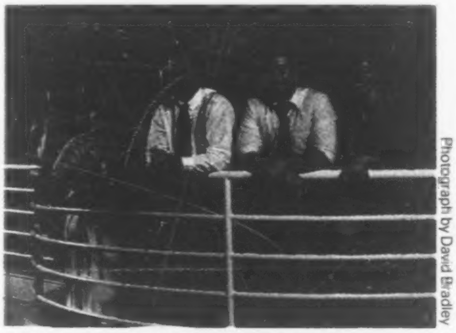
The Best of the Best

This issue of DATAMATION is about as close as the magazine can get to functioning in the way communications theorist Marshall McLuhan foresaw years ago when he said: "The medium is the message."

The medium before you is a vastly different one than the DATAMATION you usually see because its message is so exceptional: Fundamental changes are sweeping through the world's $256 billion information technology industry at a faster rate and in broader measure than at any time in its history. Technologically, the client/server model of distributed computing is reshaping the balance of power among suppliers. Geographically, the economic strength of Western Europe is overpowering the United States as an IS market. Financially, the boundaries between suppliers are blurring rapidly as superpowers seed the industry with money and seek new sources of innovation.

Fittingly, this issue of DATAMATION carries twice as many editorial pages as the average issue; four times the number of authors (writers and contributors); easily five times as much information on suppliers; and at least 20 times the number of statistics. The volume of such information and the precision required in handling it place inordinate demands on the final messengers of this medium—the managing editor, production editors, copy editors and art directors of DATAMATION. These are folks whose faces you rarely see, but they deserve as much credit as the writers and editors whose visages you're accustomed to seeing on this page.

Managing editor Steve Paul commanded the DATAMATION 100 issue from start to finish. Working with international editor Marsha Johnston, project leader Joe Kelly and research manager Brandt Brito, Paul coordinated the gathering of financial and other information on more than 300 suppliers worldwide. Partnering with Lotus Development Corp., he developed a customized version of Lotus 1-2-3 Release 3.0 to analyze the thousands of numbers fed to DATAMATION by those suppliers.



Photograph by David Bradley

COMMANDER PAUL & TROOPS: Staiti, Greenblatt, Ovans, Lewis, Gordon, Paul, Korisky.

Collaborating with copy editing specialists Andrea Ovans, Chris Staiti and Andrea Cohen, Paul shepherded 100 supplier profiles and more through the system. Teaming with production experts C.J. Korisky and Ellen Greenblatt, he translated 1-2-3 files, MCI mail messages and countless faxes into the charts and words before you. Allying art directors Chris Lewis and David Gordon, he chose the photos and design that frame this issue.

The industry, of course, is deserving of such effort. For its top 100 suppliers to have grown by more than $10 billion in 1989 is no small achievement. In the face of so much change, this expansion sends a message in itself: The best is yet to come in information technology.

Tim Mead

Tim Mead, Editor-in-chief

DATAMATION

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THE APPLICATION

DATAMATION
100

Practicing What We Preach

May in New England is a wonderful time of year. Spring is in the air, April showers give way to flowers, and the DATAMATION 100 is about to bloom with a lot of help from some cutting-edge technology.

BY STEVE PAUL

I was a young man back then in the spring of '89. DATAMATION had just moved from its New York City digs to the shining corporate offices of Cahners Publishing Co. in suburban Newton, Mass., some 10 miles west of Boston.

I had just joined the DATAMATION team as managing editor, accompanied by a new copy, art and production staff. We had no sooner warmed to our PCs and called up our spell-checkers when ominous whispers of a special issue echoed among the cubes. The DATAMATION 100 was coming. We'd be sorry, the whispers said.

To us eager, fresh-faced recruits, producing a double issue as a new staff still unfamiliar with editorial and art style seemed a worthy challenge; to do it in six weeks seemed a luxury to our biweekly oriented minds. But we were young. What did we know? We were due for a quick education. . . .

Six weeks later, as the dust and data settled, we emerged older, grayer and a lot more streetwise. It was obvious that the DATAMATION 100 was a year-round project in terms of planning, preparation and design; we needed to find an easier way.

THE DTM 100 TEAM: Steve Paul (front); (l to r) Bruce Webster, Brandt Brito and Joe Kelly.

THE DATAMATION 100

After a much-needed respite, we managed to convince Joe Kelly, coconspirator with Parker Hodges for DTM 100 '89, to lead us into the '90s. We held a preliminary planning meeting in December and, with the benefit of weeks of wisdom behind us, decided to revamp almost every aspect of the project.

We realized that we hadn't fully utilized the technology in our Newton office. Each section, copy and production editor has a Wyse Technology 286 PC packed with a 40-megabyte hard drive with 1MB memory. Tying them, as well as 13 other Cahners' publications, together is a Novell Inc. local area network server—a client/server architecture in our own backyard.

We wanted to see if we could develop an application for that architecture that could do the following:

- **Access all of our DTM 100 data, which stretches back to 1984.** Previously, the data were compiled in separate dBASE III+ databases, and we wanted to combine it into in a single spreadsheet format.
- **Perform an ad hoc query**, allowing us to analyze the six years of data with almost limitless variations.
- **Format the 22 standard tables used in last year's DTM 100.** We wanted the ability to quickly retrieve and analyze key data at the touch of a button. Included would be a currency conversion capability to automatically translate foreign currencies to their dollar equivalents.
- **Provide graphics capabilities that would let us do last-minute charts and graphs from unexpected data extractions.** Specifically, we needed a program with data formats compatible with our current editorial software (Bestinfo, XyWrite) and with an alternative, backup production source, the Apple Macintosh IIcx (running Microsoft Excel, PageMaker 3.0).
- **Produce the issue more quickly**. By finding a more efficient way to create tables, charts and graphs, we could spend less time generating the data and more time thinking about its significance. This was particularly important because we were going to produce 50% more editorial material than we produced last year.
- **Enable us to distribute the data to our readers in an industry standard format.**

DATAMATION Meets Lotus

As we were in the throes of our first DTM 100, across the Charles River in Cambridge, unsuspecting programmers at Lotus Development Corp. were toiling away on version 3.0 of Lotus 1-2-3. We had been following news of the upgrade with interest. Could this be the application for us? We knew we would need a lot of help; could we convince them it would be worth their while?

To see if we could reach a mutually agreeable partnership, we arranged a meeting in early January with the Powers That Know at Lotus: Susan Earabino, public relations manager; Rich Reily senior development manager of product technical support; and Chuck Sullivan, senior product marketing manager for 1-2-3, release 3.0.

DATAMATION EDITORS learn to love spreadsheets at Lotus' lab.

Obviously, the prestige and publicity generated by a joint venture with DATAMATION would be attractive to Lotus (we hinted). And it was an opportunity to increase their visibility in the applications development field. They were hooked.

On February 1, we got down to specifics, meeting with software applications specialist Bruce Webster—the man with all the answers, we hoped. Joe Kelly was there, as was Jordan Backler, Cahners' director of editorial services and guardian of our networked environment.

Our plans turned on three major questions: Do our PCs have enough memory for this application? Would the application interfere with a sometimes temperamental network architecture? Could it all be done in six weeks?

Jordan was apprehensive, I was skeptical. Bruce was confident. I'll be back, he said, in a month. And he promised that he would magically arrive with the first run of the application he'd tested in a comparable environment at Lotus' laboratories.

Well, it was more a matter of phone calls than magic. But, true to his word, Bruce did come back in a month with the application. He installed it on an extra 286 PC that we supplied with an added megabyte of extended memory so that it could operate as our host computer. Data from our previous DATAMATION 100s were converted to 1-2-3 from dBASE III+ and stored on the hard disk; all file extracts and ad hoc queries would be generated from this site and exported onto the network for editors to review and the copy department to check. We decided to store the database on the hard drive instead of on the network to prevent any inadvertent tampering with critical financial data.

The next two weeks were spent tweaking the application. We needed to develop a conversion format to read PostScript for the Mac, as well as make a thorough check of 1984-1988 data.

Everything worked according to plan. Graphics performance was our only source of disappointment; but actually this was due more to our unrealistic expectations. DATAMATION has a very complex and illustrative chart and graph design created using drawing software packages on the Mac. The graphics package for Lotus 3.0 is good for presentation/slide purposes, but not for the more graphically sophisticated DATAMATION.

So we needed to reassess our graphics resources. By converting our Lotus .WK3 version files to .WK2, we could translate these files to PostScript with the help of Apple File Exchange, so that they could be read by the Mac. From there some files are designed into graphs and charts using Freehand from Aldus Corp. Other files are turned into tables using Aldus' PageMaker 3.0, a program I was particularly comfortable with. We then transmit all files via modem to a nearby vendor for typeset quality reproduction. (Bruce says that Lotus intends to announce an upgrade that should promise better graphics and make this step obsolete for us for next year's 100.)

March 15th was a field trip; a half-day training session at Lotus, where we met Joe Yu, Bruce Webster's accomplice in this adventure, who helped to write the application and was there for added support—technical and moral.

The first batch of 1989 financial data was entered by our crack statisticians from Cahners' Research, Brandt Brito and Kim Friend in mid-April and completed May 3rd. Data from a total of 160 companies were input to create our 1989 database.

Breaking New Ground

Now we were cooking. We soon found out about all of the bells and whistles Lotus had packed into Lotus 3.0, providing conveniences and capabilities even beyond those we had first envisioned. New, specifically to release 3.0 were:

- A fully featured program language that enabled us to control the user interface—what the screen looks like, what the prompts are—so that we could tailor the screens to our application and our staff.
- An Add-In Toolkit for 1-2-3 release 3, which let us enter our data through data entry screens that have the ability to check data for typos and otherwise validate data, as well as translate formulas (such as translating native currencies into U.S. equivalents).
- Multiple files open in memory, which let us filter all of our currency data as we entered it, automatically converting foreign currencies into dollars at the rate correct for each particular year. In this way we could enter data in foreign currencies and they could be automatically stored in dollars and also transferred to other charts and translated back into the foreign currency.
- The three-dimensional aspect of the spreadsheet, which enabled us to produce each report on a separate worksheet in the same file, letting us see all of our tables at once.
- Relational queries and joins from disk, which gave us the ability to analyze tables containing multiple years' worth of data in a multitude of ways not limited to our original conception of what we might want to know.

From an editorial, analytical, artistic and production standpoint, our cooperative venture with Lotus was quite a coup. We were able to centralize data input; analyze historical information in our networked environment and distribute that information to the whole editorial staff; make ad hoc queries to be able to follow unexpected leads quickly; and produce complicated graphic material to a consistently high standard.

I would like to thank the people of Lotus—Susan Earabino, Rich Reily, Chuck Sullivan, Bruce Webster and Joe Yu—as well as Brandt Brito and Kim Friend of Cahners Research Department. Together, we've created a resource that will benefit the industry (and my health) throughout the year and for years to come. ▭

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To get your very own copy of the DATAMATION 100 data, tables and application please send $10 to:

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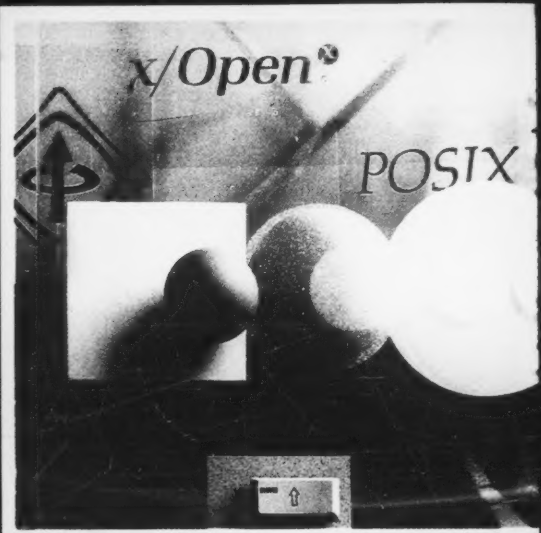
Scanning the DATAMATION 100

Here are some quick facts about how the industry shapes up as it enters the 1990s.

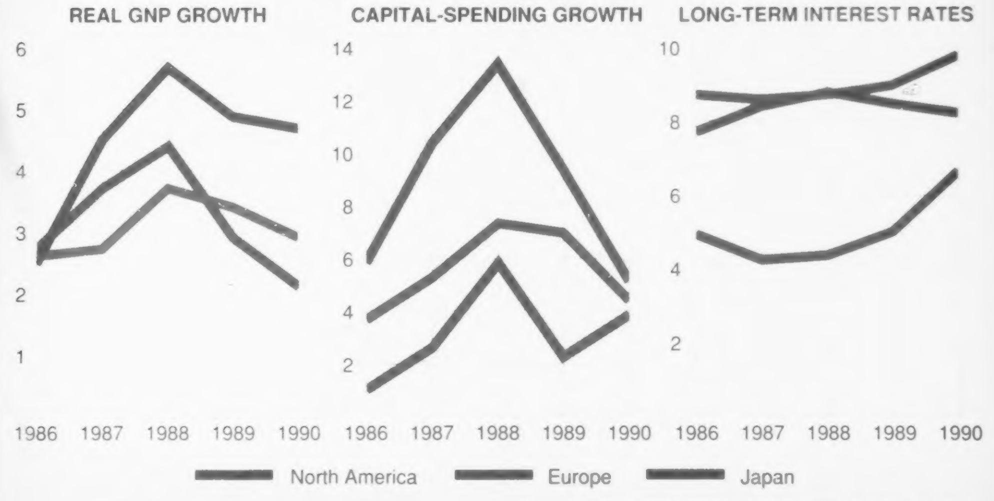
- **Composition**—62 U.S. companies (61 last year), 20 European companies (22) and 18 Asian companies (17)
- **Markets**—North American users constituted 38.6% of the global market, European users 32% and Asian users 26%
- **New Arrivals**—Black & Decker, Boeing, British Telecom, Concurrent, Conner Peripherals, Dell, Dun & Bradstreet, Ernst & Young, Everex, Intel, Kyocera, Maxtor, Mentor, Mitac, Novell, Quantum, SHL, Sligos, 3Com, Tandon
- **New Departures**—Anacomp, Atari, Dataproducts, Diebold, Emhart, Harris, McDonnell Douglas, Micropolis, Miniscribe, National Semiconductor, Sony, Zenith
- **No Longer Counted**—IS leasing companies—Atlantic Computers, Bell Atlantic, Comdisco, Continental Information Systems, Econocom, Inspectorate International, Societe Generale.
- **Fastest Climb**—SHL Systemhouse Inc.
- **Steepest Descent**—McDonnell Douglas Corp.
- **Longest Company Name**—Siemens-Nixdorf Informationssysteme AG



Reaching agreement on an open systems standard for big and small companies.

What's Driving the World Economy

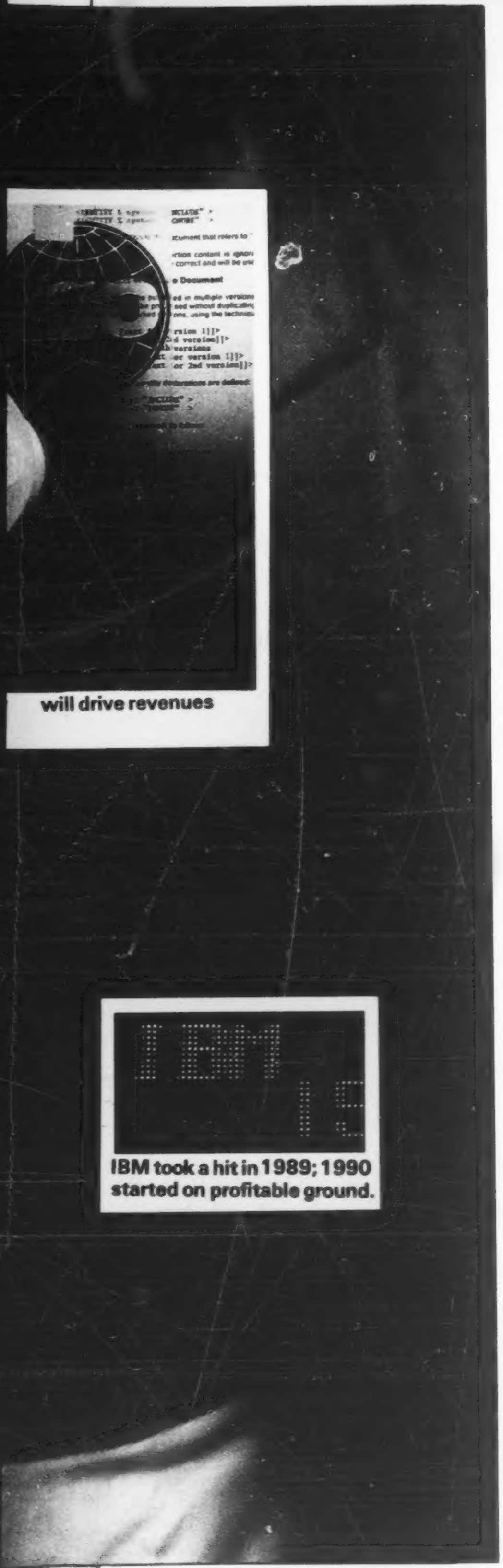
Cheap money and other factors are fueling the economic boom in Japan.



Sources: International Monetary Fund and World Economic Outlook

Photograph by David Bradley

THE DATAMATION 100



will drive revenues

IBM took a hit in 1989; 1990 started on profitable ground.

The 5.2% growth in revenues from information systems and services sold by the world's top 100 suppliers in 1989 masks more significant changes afoot in the industry. Distributed computing in an open world is a far greater challenge than most realize.

Information Technology Sales Soar to $256B

The outlook for the information systems industry couldn't be brighter on the face of it. Worldwide demand for computer hardware, software, networking and services is at records levels. Revenues of the world's top suppliers reached $255.8 billion in 1989. Users identify IS as the most important factor of production for their enterprises in the 1990s. Every new system coming from the labs of IBM, Groupe Bull, NEC Corp. and the like seems to be smaller, cheaper and yet more powerful than its predecessor.

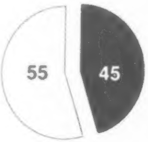
"You get so much better, well thought out technological solutions today," affirms a big customer of the industry, Merrill Lynch & Co. Inc.'s Howard Sorgen, director of information processing and technical services at the New York City-based financial giant. Adds the 31-year IS veteran: "Vendors are

BY JOSEPH KELLY

working so much harder, they are earning the business."

Underneath the surface, however, executives who manage the companies providing IS solutions see a darker, more treacherous side to the business—one fraught with change. The very things that dazzle the public and delight big users like Merrill Lynch—standards, 12-month product cycles, mainframe power on a desk, global connectivity, etc.—cause heartburn in Armonk, Paris, Tokyo and the headquarters of countless other IS suppliers.

Satisfying customers weaned on the 1980s' promise of more, more, more for less, less, less is taking its toll. And it may be even more painful as the pace of change in the industry accelerates throughout the 1990s.



Only 45 DTM 100 companies report IS as 100% of their total revenue.

A Lackluster Financial Performance

The price exacted by achieving customer satisfaction is evident on the top line and the bottom line of the collective financial results posted by the world's top suppliers that constitute the DATAMATION 100. IS revenues for these companies grew just 5.2% in 1989, which is less than one-third of the growth rate of the last two years. Clearly, a number of companies weren't delivering as many new solutions as they needed to satisfy users or to keep up with rivals. Witness the decline in virtually flat growth at Unisys Corp. and NCR Corp. over the last two years.

Those suppliers that shipped hardware and software components of the client/server model of distributed computing—or serviced it by way of networking or systems integration—had no trouble growing in 1989. For example, Sun Microsystems Inc. increased its sales 40% to $2.1 billion by solving users' needs for high-performance networked computing based on reduced instruction set computing (RISC) and industry standard (UNIX) software. Bull added more than $1 billion to its IS revenues, which reached $6.5 billion, by acquiring Zenith Data Systems Corp., whose MS-DOS, OS/2 and UNIX desktop systems and portable computers fit the model. The networking arm of Japan's giant communications monopoly, Nippon Telegraph and Telephone Corp. (NTT), expanded its business 32% to $2.3 billion on the strength of its ability to integrate superservers, new technologies and standards.

Foreign Exchange

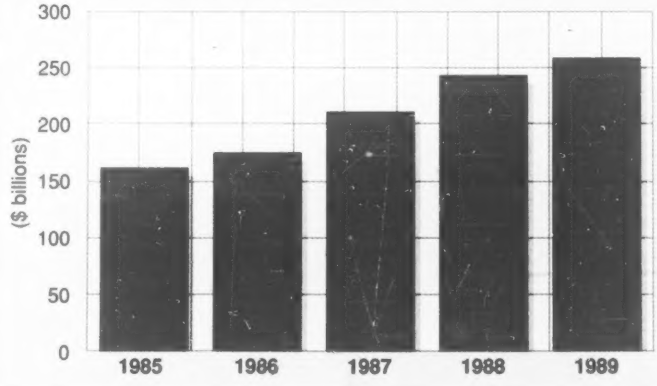
Values of foreign currency (equivalent to one dollar) used in this year's DTM 100*

AUSTRALIA	$A1.2648
AUSTRIA	S13.2305
BELGIUM	BF39.3996
CANADA	C$1.1840
DENMARK	DKr7.3100
EUROPEAN CURRENCY	ECU0.9082
FINLAND	Mk4.2881
FRANCE	Fr6.3801
ITALY	L1371.6871
JAPAN	¥137.9741
NETHERLANDS	G2.1209
NORWAY	NKr6.9033
SOUTH KOREA	W665.1686
SPAIN	Pta118.3978
SWEDEN	Shr6.4462
SWITZERLAND	SFr1.6355
TAIWAN	NT$26.2783
UNITED KINGDOM	£0.6114
WEST GERMANY	DM1.8800

*OECD average exchange rates

The World's Biggest Industrial Market Expands

Revenues for the DTM 100 have grown nearly $100 billion in five years.



Overshadowing such positive results, however, was the negative financial performance of several of the industry's leaders in 1989. Although earnings disappointments are de rigueur in information technology, the litany of companies reporting disappointing results in net income for 1989 reads like a *Who's Who* of the business: IBM—down 35%; Digital Equipment Corp.—down 28%; Amdahl Corp.—down 30%; etc. Even in Europe, where demand for IS is running at peak levels, Ing. C. Olivetti & Co. SpA suffered a 43% decline in earnings to L202.8 billion ($147.3 million). Only the highly diversified Japanese suppliers reported consistently good profit performance.

Where did the profits go? In part, they went into restructuring costs and stock buy-backs, which totaled some $5 billion among U.S. companies. IBM topped everyone in this regard, taking a $2.3 billion charge against its fourth-quarter 1989 earnings to cover the cost of plant closings and early retirements.

But, mainly, profits just disappeared into operating margins, the difference between what it costs a supplier to create a product or service and what that product or service sells for. The systems that are spurring industry growth today—personal computers and workstations—command lower margins than other technologies. Although the economics of distributed systems was known to supplier executives for some time, the pace of this economic revolution caught most off guard. "The speed of the shift surprised us," admits James A. Unruh, who has taken over for Michael Blumenthal as chairman and chief executive officer of Unisys Corp. How surprised was the Blue Bell, Pa.-based company? It lost $639 million in 1989, despite realizing IS sales of nearly $9.4 billion.

The margin squeeze affects even those suppliers that figured out early on that users were going to demand standards-based distributed-computing platforms in the 1990s. Hewlett-Packard Co., despite growing its IS revenues 24% to $7.8 billion in 1989, didn't make as much money on its systems as it had in previous years. Gross margins for the Palo Alto computer maker dropped from 52.2% in 1987 to 48.8% in 1989. They'll sink even further in the future to 46.1%, estimates Sanford C. Bernstein & Co., an investment research and management firm in New York City.

Even if traditional minicomputer suppliers like HP are able to adjust to somewhat lower profit margins, it's unclear just how far they can go to compete against companies that do nothing but offer standards-based solutions on desktop platforms. "We are profitable on 30% gross margins," points out Thomas Yuen, cochairman of AST Research Inc., the $482 million PC maker in Irvine, Calif. "While it may be technically feasible for minicomputer manufacturers to move their products downward, financially it will be difficult for them to do so." He cites Digital as an example. If the world's No. 2 computer maker tried to realize one-fourth of its revenues from servicing PCs as it does today in minicomputers, Yuen says, Digital would be out of business. "Old habits are hard to break," Yuen says of the minicomputer companies' plight.

Wall Street Winds Down

As if adapting to the new economics of distributed computing weren't enough of a challenge for suppliers, they must also cope with flat U.S. demand for new systems and services.

Divining the reasons for the slowdown in U.S. spending on IS is a topic of conversation at virtually every industry gathering. To some, it's due to undersupply of critical technology (See "What's Right with the U.S. Market," p. 38.) To others, it's a natural consequence of a market that has just run out of gas after accelerating 15% annually in the late 1970s and early 1980s. U.S. spending on high technology (everything from computers to copiers) peaked in 1985 as a percentage of capital spending and will continue to be a smaller share of the overall capital investment, maintains Stephen S. Roach, chief economist at the Big Apple investment house Morgan Stanley & Co. Inc.

One of the big culprits in the spending slowdown is the financial services industry. Investment banks, commercial banks, savings and loan institutions, insurance companies and real estate enterprises displayed an almost insatiable appetite for IS during the bull market of the 1980s. But the stock market crash of 1987, the fall in real-estate values (and hence mortgage loans) in the Southwest and Northeast, natural disasters and other events have sharply curbed Wall Street's and Main Street's hunger for computers. In fact, many are consolidating—not expanding—their IS operations. Merrill Lynch & Co. Inc. is a case in point; the firm is reducing the number of its data centers from seven to two.

Merrill Lynch and other big IS customers are demanding that suppliers reduce or at least govern the total cost of using information systems—not just the hardware component. Operations support, the cost of real estate and facilities, salaries for programmers maintaining old programming code—all of that is rising, not declining. Until suppliers help cut those costs, sales of hardware to U.S. sites will remain depressed. "The market is responsive to total solution price/performance," says Don Young, a securities analyst for Bernstein. "Mainframe IS staffs are developing, supporting and operating systems in the same way they did five years ago. And the systems are getting more complicated, involving more resources to implement."

Fast Trackers

The companies that grew the most in 1989

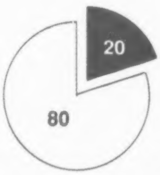
	1989 RANK	COMPANY	IS REV. IN LOCAL CURRENCY 1989	1988	% INCREASE
1	71	SHL*	C$639.1	C$240.0	166.3%
2	80	Ernst & Young*	$450.0	$178.0	152.8%
3	91	Quantum	$394.2	$172.5	128.5%
4	79	Dun & Bradstreet*	$450.0	$200.0	125.0%
5	57	Oracle	$769.3	$394.9	94.8%
6	97	Kyocera	¥50,554.0	¥33,126.8	52.6%
7	93	Dell	$388.6	$257.8	50.7%
8	65	American Express*	$660.0	$446.9	47.7%
9	24	NTT	¥311,000.0	¥217,086.1	43.3%
10	85	Mentor	$426.4	$300.8	41.8%

* Growth partly due to merger or major acquistion
All revenue figures are in millions.

Although IS suppliers have responded to the rising support costs faced by their customers with new products and services, their full effect won't be felt by vendors for some time. Improvements to large-scale computer operating systems (like automating storage management) and to programming (like computer-aided software engineering tools) won't begin to significantly raise demand for big systems until middecade.

Until CASE and other tools really take hold, however, suppliers are resorting to the only other alternative available for keeping the cost of computing low: heavy discounts on new systems. Users of large-scale systems, midrange systems and workstations are typically getting 15%-off list price deals from suppliers. Such aggressive pricing can, in some cases, spur significantly heightened demand from users. In 1989 IBM, for example, saw its U.S. sales climb for the first time since 1985—thanks, in part, to extremely aggressive mainframe pricing.

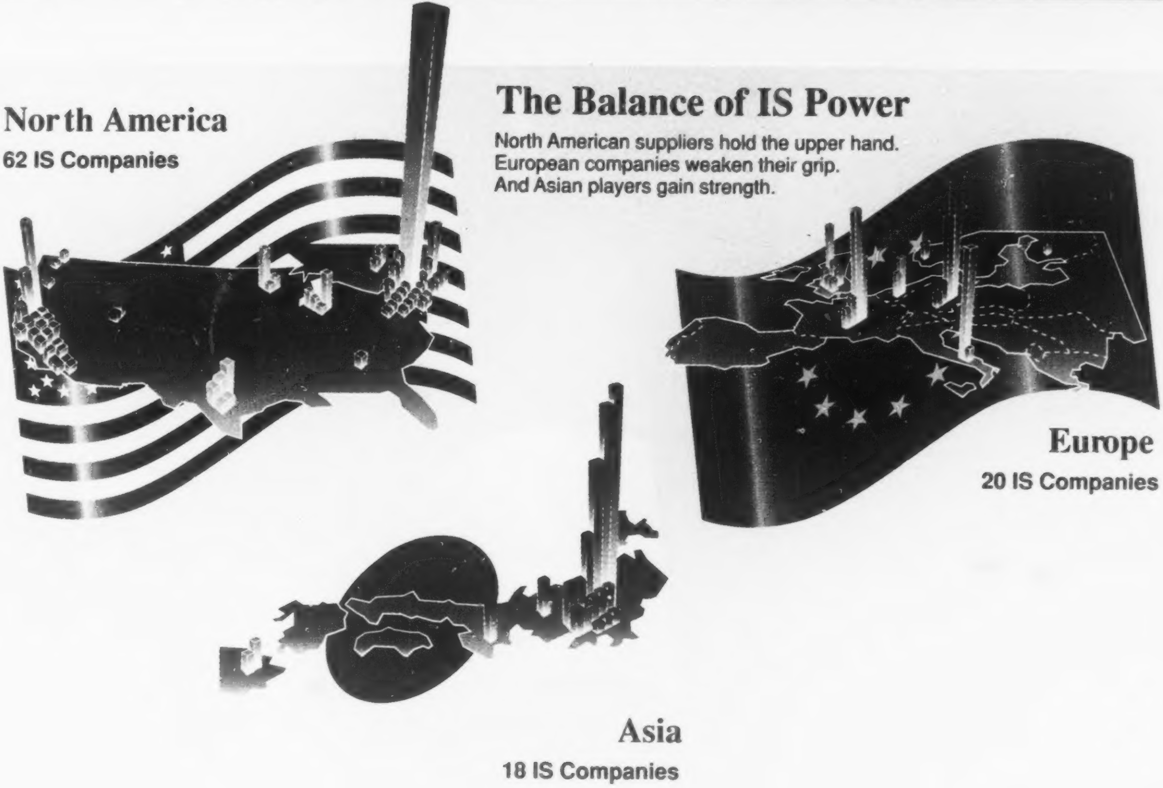
For most of the IS industry, the strategy for future growth is to switch to systems built around standards—whether the commonly accepted operating



There are 20 new entrants in the 1989 DTM 100.

The Balance of IS Power

North American suppliers hold the upper hand.
European companies weaken their grip.
And Asian players gain strength.



Rank	Company	Location	Total Rev.
	NORTH AMERICA		
	CANADA		
47	Northern Telecom	Mississauga	1,150.0
71	SHL Systemhouse	Ottawa	539.8
	UNITED STATES		
	EAST COAST		
1	IBM	Armonk, NY	60,805.0
2	Digital	Maynard, MA	12,936.7
5	Unisys	Blue Bell, PA	9,390.0
17	AT&T	New York City	2,865.0
20	Xerox	Stamford, CT	2,790.0
21	Wang	Lowell, MA	2,697.0
36	ADP	Roseland, NJ	1,689.5
39	Prime	Natick, MA	1,520.0
43	Data General	Westborough, MA	1,296.5
44	CA	Garden City, NY	1,290.1
51	Commodore	West Chester, PA	866.5
58	General Electric	Fairfield, CT	740.0
63	Black & Decker	Towson, MD	687.6
65	American Express	New York City	660.0
70	Lotus	Cambridge, MA	556.0
73	Martin Marietta	Bethesda, MD	502.2
74	NYNEX	White Plains, NY	495.0
79	Dun & Bradstreet	New York City	450.0
80	Ernst & Young	New York City	450.0
82	Kodak	Rochester, NY	445.0
92	Shared Medical	Malvern, PA	390.0
100	Concurrent	Tinton Falls, NJ	344.6
	MIDWEST		
12	NCR	Dayton, OH	5,319.0
35	Control Data	Bloomington, MN	1,691.0
38	TRW	Cleveland	1,643.0
45	Andersen	Chicago	1,225.7
53	Motorola	Schaumburg, IL	860.0
56	Cray	Minneapolis	784.7
61	3M	St. Paul	696.4
	SOUTH		
52	Intergraph	Huntsville, AL	860.1
	SOUTHWEST		
16	Compaq	Houston	2,876.1
23	EDS	Dallas	2,477.9
31	Tandy	Fort Worth	1,892.0
67	TI	Dallas	585.0
93	Dell	Austin, TX	388.6
	WEST		
49	Storagetek	Louisville, CO	982.5
84	Novell	Provo, UT	429.9
	WEST COAST		
7	Hewlett-Packard	Palo Alto	7,800.0
11	Apple	Cupertino, CA	5,372.3
26	Amdahl	Sunnyvale, CA	2,101.0
27	Sun	Mountain View, CA	2,062.5
34	Seagate	Scotts Valley, CA	1,797.0
37	Tandem	Cupertino, CA	1,676.8
41	CSC	El Segundo, CA	1,442.8
50	Microsoft	Redmond, WA	952.8
55	Intel	Santa Clara	812.0
57	Oracle	Belmont, CA	769.3
60	Conner	San Jose	704.9
66	Lockheed	Calabasas, CA	590.0
76	AST Research	Irvine, CA	482.0
77	Science App.	San Diego	479.0
78	Wyse	San Jose	452.3
81	Maxtor	San Jose	447.2
85	Mentor	Beaverton, OR	426.4
87	3COM	Santa Clara	413.9
88	Everex	Fremont, CA	402.0
90	MAI Basic Four	Tustin, CA	397.0
91	Quantum	Milpitas, CA	394.2
96	Tandon	Moorpark, CA	377.9
98	Boeing	Bellevue, WA	359.2
	THE FAR EAST		
	JAPAN		
3	NEC	Tokyo	11,480.4
4	Fujitsu	Tokyo	11,378.9
6	Hitachi	Tokyo	8,719.0
13	Toshiba	Tokyo	4,595.1
14	Canon	Tokyo	3,783.3
15	Matsushita	Osaka	3,663.7
24	NTT	Tokyo	2,254.0
25	Nihon Unisys	Tokyo	2,112.7
29	Mitsubishi	Tokyo	2,025.7
30	Oki	Tokyo	1,952.0
33	Ricoh	Tokyo	1,799.5
40	Seiko Epson	Nagano	1,449.5
42	C. Itoh	Tokyo	1,345.9
72	CSK	Tokyo	520.0
86	Alps	Tokyo	420.4
97	Kyocera	Kyoto	366.4
	TAIWAN		
75	Acer	Taipei	493.7
94	Mitac	Taipei	380.0
	EUROPE		
	UNITED KINGDOM		
22	STC	London	2,643.4
59	Amstrad	Essex	717.0
62	British Telecom	London	692.5
68	Racal	Berkshire	573.9
83	SD-Scicon	Hampshire	431.5
95	Sema Group	London	378.6
	THE NETHERLANDS		
18	NV Philips	Eindhoven	2,814.8
28	Memorex	Amsterdam	2,056.6
	FRANCE		
8	Groupe Bull	Paris	6,465.4
32	Alcatel	Paris	1,800.3
48	Cap Gemini	Paris	1,103.4
89	Sligos	Paris La Defense	400.7
	WEST GERMANY		
9	Siemens	Munich	6,010.6
19	Nixdorf	Paderborn	2,792.6
54	Mannesmann	VS-Villigen	819.1
69	Comparex	Mannheim	566.0
	SCANDINAVIA		
46	Nokia	Helsinki, Finland	1,191.9
99	Norsk Data	Oslo, Norway	358.1
	ITALY		
10	Olivetti	Ivrea	5,573.3
64	Finsiel	Rome	662.5

Revenue figures are in millions of dollars.

systems like UNIX, MS-DOS or OS/2 or industry-approved communications protocols like Open Systems Interconnect (OSI). So-called open systems will drive revenues for the majority of suppliers in the 1990s. Only IBM, Digital and some Japanese suppliers seem to have customer bases big enough to buy enough proprietary platforms to keep them growing. Anyone smaller—even those on the scale of a $5.3 billion NCR Corp. or a $5.6 billion Olivetti—must be committed to open platforms.

Open Systems Strategies for Survival

"By the time the decade is over, I would expect that most, practically all, of our users of our proprietary products will be wearing the open systems hat," predicts Charles Exley, chairman of Dayton, Ohio-based NCR.

"If we had been caught in 1989 without the transitions we have been making since 1987, it would have been a disaster for us," says Vittorio Cassoni, comanaging director of Olivetti. He's referring to the Ivrea, Italy-based company's decision three years ago to move away from proprietary systems toward open platforms. Proprietary products only generated about 10% Olivetti's 1989 system sales.

The transition to the new economics of distributed computing is affecting new product strategies in almost every corner of the industry, particularly among minicomputer makers. Most of the leading U.S. mini producers—Data General Corp, MAI Basic Four Inc., Prime Computer Inc. and Wang Laboratories Inc.—either market UNIX-based hardware or intend to do so. The switch from proprietary products is costing them, however. In 1989, DG lost $121 million; MAI $40 million; Prime $277 million; Wang $511 million. On the other side of the Atlantic, minicomputer makers had their woes too. Norsk Data AS of Norway lost $69 million.

The slowdown in the U.S. market and the squeeze on profits in 1989 led to a predictable escalation in demands for a high-tech industrial policy in the United States. Advocates of such a policy, like Intel Corp. president Andrew Grove, maintain that the U.S. system of funding technology initiatives—via money raised from venture capitalists or public stock offerings—can't compete with Japan's system. In Japan, individual companies either make long-term investments in new technology on their own or in groups in consultation with government planners—often because of economic incentives (e.g., lower interest rates) and government directives. They also enjoy much closer and friendlier ties to banks, which are themselves oriented toward the long term.

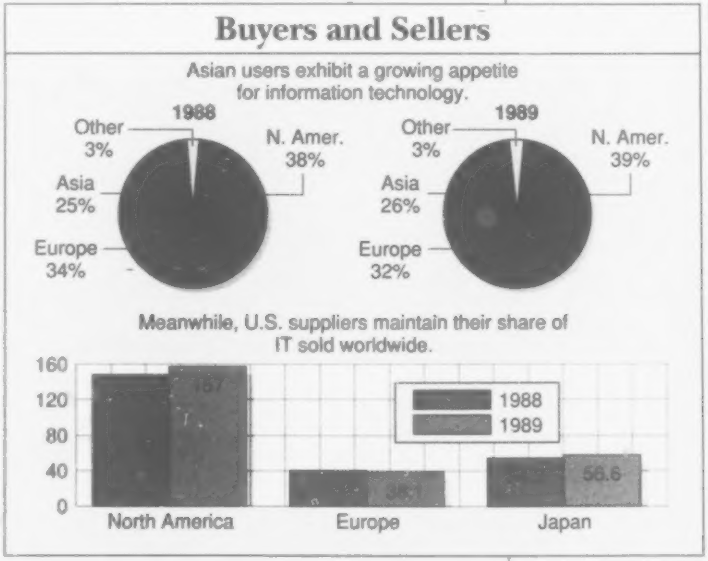
But the noise made by policy-minded U.S. executives apparently isn't reaching the White House. The Bush administration has promised only to back measures like the proposed capital gains tax cut and the relaxation of antitrust laws, which benefit companies in all industries, not just high tech. Executives do credit the administration for trying to pry open the Japanese market for big ticket items like satellites and supercomputers. However, they have only themselves to blame for the collapse of U.S. Memories, an industrial consortium proposed to keep the United States competitive in the area of memory chips.

The two most important components of the IS industry, when judged on the basis of growth alone, are the software and services associated with systems. One has to look no further than the ranks of the DATAMATION 100 to see that the companies providing programs to run on computers and those integrating them are enjoying spectacular growth. For example, Electronic Data Systems Corp. of Dallas expanded its non-General Motors Corp. systems integration business 30% to nearly $2.5 billion in 1989. Cap Gemini Sogeti of Paris grew 21% to $1.1 billion on the strength of its IS services.

Software & Services Are Pivotal

There are now at least seven software or service suppliers with annual IS revenues in excess of $1 billion. Besides EDS and Cap Gemini, there are Andersen Consulting, Automatic Data Processing Inc., Computer Associates International Inc., Computer Sciences Corp. (CSC) and TRW Inc.

The biggest force in software flexed its muscles in 1989. Not only did IBM grow its software business beyond $8 billion, Big Blue also invested in several software companies—including several members of the DATAMATION 100. Notable among them was Management Science America Inc. (now part of Dun & Bradstreet Software). IBM is also increasing the number of software programmers it employs, even as it cuts back on workers in other areas.



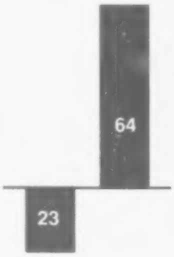
Buyers and Sellers

Asian users exhibit a growing appetite for information technology.

Meanwhile, U.S. suppliers maintain their share of IT sold worldwide.

The excitement and investment in software is by no means confined to the United States. In Europe, several other companies besides Cap Gemini are riding the software wave. Finsiel SpA of Rome and SD-Scicon PLC in Fleet, U.K., have boasted consistently strong growth rates and profitability. Even established hardware manufacturers in Europe are depending more on software and service sales. The computer division of London-based STC PLC now draws nearly half of its $860 million from these seg-

Sixty-four DTM 100 companies climbed in ranking.



Twenty-three companies took the plunge.

ments. Even Japan has caught the systems integration bug. "We are not in competition for hardware anymore," Hiroshi Yoshida, an executive with Nihon Unisys Ltd., told DATAMATION. "What clients are looking for now is personalized services and design capabilities."

But software and services have yet to give the industry the kick it needs to regain double-digit growth or attain higher profits. For instance, IBM's software revenues rose only 6.3% in 1989. Pure-play software providers even find the going unsteady: witness the less-than-stellar quarterly performances turned in by Computer Associates and Oracle. And who knows how much cutbacks in U.S. government spending will affect service companies like CSC.

Customer Focus Becomes Critical

Software and services, however, represent more than market segments. They reflect just how successful companies—particularly hardware suppliers—are at understanding customer needs and developing products to meet those needs. For a number of vendors, that means a whole new way of doing business. They have to shift the emphasis of research and development out of labs and into customer sites. They have to embark on new distribution strategies—establishing partnerships to open channels that can best deliver distributed-computing solutions to users. They have to develop global offerings that, nevertheless, can be customized region by region. In short, they have to listen not to their own employees as much as their customers.

Hearty Workers

The companies with the highest revenues per employee

	1989 RANK	COMPANY	REV. PER EMPL. ($ THOU.)	IS REV. ($ MIL.)	EMPLS.
1	59	Amstrad	622.0	1,024.4	1,647
2	91	Quantum	615.9	394.2	640
3	96	Tandon	503.9	377.9	750
4	69	Comparex	494.3	566.0	1,145
5	11	Apple	370.1	5,372.3	14,517
6	4	Fujitsu	357.2	18,073.8	50,600
7	24	NTT	322.0	2,254.0	7,000
8	57	Oracle	307.7	769.3	2,500
9	16	Compaq	302.7	2,876.1	9,500
10	51	Commodore	270.8	866.5	3,200

Long-Term Players

The companies spending the most on research

			R&D	
	1989 RANK	COMPANY	AS % OF TOT. REV.	CORP. 1989
1	24	NTT	32.2%	724.8
2	38	TRW	24.7%	1,811.5
3	56	Cray	18.3%	143.3
4	70	Lotus	17.0%	94.3
5	3	NEC	15.7%	3,681.9
6	85	Mentor	15.1%	64.5
7	50	Microsoft	15.0%	143.1
8	5	Unisys	14.3%	1,445.0
9	44	Computer Associates	13.6%	176.0
10	43	Data General	13.2%	171.6

Revenue figures are in millions of dollars.

One subject they had better lend an ear to is outsourcing. Increasingly, large users of information systems are asking service providers to assume control of some aspects of their IS operations. Outsourcing, to be profitable for users and suppliers, depends on a degree of cooperation and understanding between both; such cooperation is almost unprecedented in the history of the industry. Fools who rush into the business may find themselves drowning in red ink. Those who avoid it may find themselves out of touch with users.

When suppliers are on top of changes—such as the need for users in the 1980s to express their individuality via personal computing and the technology (microprocessors) that enabled it—they flourish. When they are in the throes of change—such as the swift movement toward distributed computing confronting suppliers today—they flounder.

"Does the data-processing industry have to start each decade with a stumble?" asked Frederic G. Withington in an article in DATAMATION 10 years ago on the subject of how the industry looked going into 1980. The analysis by Withington, a former DATAMATION adviser and consultant with Arthur D. Little Inc., would play as well today as it did in 1980. At the time, earnings for the world's top computer makers were off—including the first downturn in IBM's earnings since the early 1950s. Rising wages and other support costs were threatening suppliers' ability to deliver continued gains in the price and performance of systems.

But the similarities end there. At the start of the 1980s, the number of people who knew how to operate a computer was small. Marketing took a back seat to engineering. Customers were fed technology by computer makers. Today, there are at least a 100 million people in the world who know how to boot up a personal computer. Marketing and engineering are almost synonymous functions at most companies. And customers only want to be fed solutions—not bits and bytes.

Profitability will undoubtedly return to the IS industry. Just as the PC spurred the growth of the 1980s, there will be a new horse, or horses, to ride in the 1990s. Desktop systems based on standard platforms, networked together in client/server relationships will be the heart of corporate information management.

There will also be a new horse to ride in higher margin software and services. But the difference—and it's a big one—is who will be holding the reins. It's not the suppliers anymore, it's the customers—you. ▭

Joseph Kelly, a contributing editor based in New York City, comanaged the DATAMATION 100 project.

THE DATAMATION 100

1989 WORLD RANK	1988 WORLD RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	IS REV. % CHANGE	1989 TOTAL REVENUE	IS AS % OF TOTAL REVENUE
1	1	IBM	60,805.0	55,002.8	10.5%	62,710.0	97.0%
2	2	Digital	12,936.7	12,284.7	5.3%	12,936.7	100.0%
3	4	NEC	11,480.4	10,475.7	9.6%	23,388.9	49.1%
4	3	Fujitsu	11,378.9	10,999.1	3.5%	18,073.8	63.0%
5	5	Unisys	9,390.0	9,133.0	2.8%	10,097.0	93.0%
6	6	Hitachi	8,719.0	8,247.6	5.7%	49,064.3	17.8%
7	7	Hewlett-Packard	7,800.0	6,300.0	23.8%	11,899.0	65.6%
8	11	Groupe Bull	6,465.4	5,296.7	22.1%	6,465.4	100.0%
9	8	Siemens	6,010.6	5,951.0	1.0%	32,514.9	18.5%
10	9	Olivetti	5,573.3	5,427.9	2.7%	6,583.9	84.7%
11	12	Apple	5,372.3	4,434.1	21.2%	5,372.3	100.0%
12	10	NCR	5,319.0	5,324.0	-0.1%	5,956.0	89.3%
13	13	Toshiba	4,595.1	4,226.6	8.7%	28,896.7	15.9%
14	15	Canon	3,783.3	3,391.6	11.5%	9,791.1	38.6%
15	14	Matsushita	3,663.7	3,441.0	6.5%	40,877.4	9.0%
16	24	Compaq	2,876.1	2,065.6	39.2%	2,876.1	100.0%
17	21	AT&T	2,865.0	2,445.0	17.2%	36,112.0	7.9%
18	19	NV Philips	2,814.8	2,794.6	0.7%	26,981.0	10.4%
19	18	Nixdorf	2,792.6	3,044.9	-8.3%	2,792.6	100.0%
20	20	Xerox	2,790.0	2,650.0	5.3%	17,635.0	15.8%
21	17	Wang	2,697.0	2,918.9	-7.6%	2,697.0	100.0%
22	22	STC	2,643.4	2,425.1	9.0%	4,264.6	62.0%
23	27	EDS	2,477.9	2,007.1	23.5%	5,466.8	45.3%
24	32	NTT	2,254.0	1,694.0	33.1%	2,254.0	100.0%
25	25	Nihon Unisys	2,112.7	2,057.7	2.7%	2112.7	100%
26	28	Amdahl	2,101.0	1,802.0	16.6%	2,101.0	100.0%
27	37	Sun	2,062.5	1,461.6	41.1%	2,062.5	100.0%
28	23	Memorex	2,056.6	2,078.5	-1.1%	2,056.6	100.0%
29	44	Mitsubishi	2,025.7	1,973.0	2.7%	21,032.9	9.6%
30	36	Oki	1,952.0	1,761.0	10.8%	3,858.1	50.6%
31	29	Tandy	1,892.0	1,792.4	5.6%	4,285.7	44.1%
32	31	Alcatel	1,800.3	1,716.0	4.9%	14,086.1	12.8%
33	30	Ricoh	1,799.5	1,727.5	4.2%	5,880.8	30.6%
34	40	Seagate	1,797.0	1,351.0	33.0%	1,797.0	100.0%
35	16	Control Data	1,691.0	2,538.0	-33.4%	2,934.5	57.6%
36	33	ADP	1,689.5	1,617.0	4.5%	1,689.5	100.0%
37	38	Tandem	1,676.8	1,424.7	17.7%	1,676.8	100.0%
38	26	TRW	1,643.0	1,611.0	2.0%	7,340.4	22.4%
39	34	Prime	1,520.0	1,594.0	-4.6%	1,520.0	100.0%
40	35	Seiko Epson	1,449.5	1,487.7	-2.6%	N/A	N/A
41	45	CSC	1,442.8	1,253.4	15.1%	1,442.8	100.0%
42	51	C. Itoh	1,345.9	1,154.0	16.6%	120,856.7	1.1%
43	42	Data General	1,296.5	1,330.5	-2.6%	1,296.5	100.0%
44	55	Computer Associates	1,290.1	925.3	39.4%	1,290.1	100.0%
45	49	Andersen Consulting	1,225.7	945.2	29.7%	1,442.0	85.0%
46	50	Nokia	1,191.9	1,165.1	2.3%	5,315.9	22.4%
47	56	Northern Telecom	1,150.0	900.0	27.8%	6,105.5	18.8%
48	53	Cap Gemini	1,103.4	976.5	13.0%	1,103.4	100.0%
49	58	StorageTek	982.5	883.7	11.2%	982.5	100.0%
50	66	Microsoft	952.8	718.6	32.6%	952.8	100.0%

THE DATAMATION 100

			R&D				
1989 EMPLOYEES	% EMPL. CHANGE FROM 1988	IS REV. PER EMPL. ($ THOU.)	CORP. 1989	AS % OF TOT. REV.	NET INCOME	% RETURN ON SALES	FISCAL YEAR END
383,220	-1.0%	163.6	6,827.0	10.9%	3,758.0	6.0%	December
125,900	1.2%	102.8	1,580.7	12.2%	875.8	6.8%	June
116,890	10.8%	200.1	3,681.9	15.7%	518.9	2.2%	March
50,600	-46.6%	357.2	1,856.9	10.3%	623.1	3.4%	March
82,300	-11.5%	122.7	1,445.0	14.3%	-639.0	-6.3%	December
290,000	80.1%	169.2	2,915.8	5.9%	1,463.3	3.0%	March
95,000	9.2%	125.3	1,273.0	10.7%	829.0	7.0%	December
47,332	3.9%	136.6	580.2	9.0%	-41.8	-0.6%	December
365,000	3.4%	89.1	3,656.9	11.2%	838.8	2.6%	September
56,937	-1.1%	115.6	348.5	5.3%	147.3	2.2%	December
14,517	34.0%	370.1	416.4	7.8%	438.4	8.2%	September
56,000	-6.7%	106.4	446.0	7.5%	412.0	6.9%	December
142,000	10.1%	203.5	1,667.0	5.8%	935.0	3.2%	August
41,000	0.6%	238.8	637.8	6.5%	282.1	2.9%	December
193,088	43.9%	211.7	2,377.6	5.8%	1,570.1	3.8%	March
95,00	58.3%	302.7	132.5	4.6%	333.3	11.6%	December
283,500	-6.8%	127.4	2,652.0	7.3%	2,697.0	7.5%	December
304,800	-1.8%	88.5	2,148.6	8.0%	647.8	2.4%	December
31,037	0.0%	90.0	271.3	9.7%	N/A	0.0%	December
111,400	11.3%	158.3	809.0	4.6%	704.0	4.0%	December
N/A	N/A	N/A	243.4	9.0%	-511.0	-18.9%	June
36,393	7.5%	117.2	443.7	10.4%	288.2	6.8%	December
57,200	13.5%	95.6	N/A	0.0%	435.3	8.0%	December
7,000	-97.5%	322.0	724.8	32.2%	23.5	1.0%	March
8,181	6.1%	261.4	N/A	N/A	34.1	1.6%	March
8,200	0.0%	256.2	277.0	13.2%	153.0	7.3%	December
10,560	28.0%	195.3	265.4	12.9%	36.1	1.8%	June
9,993	-24.0%	205.8	28.9	1.4%	-54.2	-2.6%	March
89,500	18.1%	235.0	1,050.9	5.0%	488.5	2.3%	March
18,440	-1.2%	209.2	304.4	7.9%	96.7	2.5%	N/A
38,000	2.7%	112.8	N/A	0.0%	303.9	7.1%	June
121,000	-4.7%	116.4	1,479.9	10.5%	526.3	3.7%	December
34,385	4.2%	171.0	336.8	5.7%	157.6	2.7%	March
40,880	57.2%	44.0	67.8	3.8%	104.7	5.8%	June
18,000	-46.5%	163.0	289.2	9.9%	-680.4	-23.2%	December
20,500	-6.8%	82.4	87.9	5.2%	196.2	11.6%	June
9,790	11.9%	171.3	214.6	12.8%	117.8	7.0%	September
74,280	1.5%	98.8	1,811.5	24.7%	263.0	3.6%	December
10,670	-14.6%	142.5	173.2	11.4%	-276.8	-18.2%	December
N/A	N/A	N/A	0.0	N/A	0.0	N/A	December
21,100	6.6%	68.4	0.0	0.0%	58.4	4.0%	March
N/A	N/A	N/A	N/A	0.0%	N/A	0.0%	March
13,015	-12.1%	99.6	171.6	13.2%	-120.7	-9.3%	September
6,500	1.6%	198.5	176.0	13.6%	133.2	10.3%	March
18,000	1.1%	80.1	N/A	0.0%	N/A	0.0%	August
41,326	-7.3%	128.6	268.7	5.1%	36.4	0.7%	December
47,572	-5.1%	128.3	729.8	12.0%	354.1	5.8%	December
13,500	12.5%	81.7	73.7	6.7%	N/A	0.0%	December
9.300	4.5%	105.6	85.7	8.7%	47.7	4.9%	December
N/A	N/A	N/A	143.1	15.0%	210.5	22.1%	June

THE DATAMATION 100

1989 WORLD RANK	1988 WORLD RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	IS REV. % CHANGE	1989 TOTAL REVENUE	IS AS % OF TOTAL REVENUE
51	54	Commodore	866.5	926.1	-6.4%	866.5	100.0%
52	60	Intergraph	860.1	800.2	7.5%	860.1	100.0%
53	61	Motorola	860.0	790.0	8.9%	9,620.0	8.9%
54	63	Mannesmann	819.1	779.0	5.2%	986.7	83.0%
55	129	Intel	812.0	650.0	24.9%	3,127.0	26.0%
56	64	Cray	784.7	756.3	3.8%	784.7	100.0%
57	90	Oracle	769.3	394.9	94.8%	769.3	100.0%
58	68	General Electric	740.0	675.0	9.6%	54,574.0	1.4%
59	59	Amstrad	717.0	841.8	-14.8%	1,024.4	70.0%
60	N/A	Conner Peripherals	704.9	N/A	N/A	704.9	100.0%
61	75	3M	696.4	588.0	18.4%	11,990.0	5.8%
62	N/A	British Telecom	692.5	N/A	N/A	19,475.0	3.6%
63	80	Black & Decker	687.6	508.9	35.1%	3,190.3	21.6%
64	78	Finsiel	662.5	545.4	21.5%	662.5	100.0%
65	86	American Express	660.0	446.9	47.7%	25,047.0	2.6%
66	72	Lockheed	590.0	620.0	-4.8%	9,891.0	6.0%
67	76	Texas Instruments	585.0	577.0	1.4%	6,521.9	9.0%
68	77	Racal	573.9	554.1	3.6%	2,894.0	19.8%
69	73	Comparex	566.0	614.5	-7.9%	566.0	100.0%
70	82	Lotus	556.0	468.5	18.7%	556.0	100.0%
71	N/A	SHL	539.8	195.0	176.9%	539.8	100.0%
72	69	CSK	520.0	466.6	11.4%	520.0	100.0%
73	65	Martin Marietta	502.2	743.4	-32.4%	5,796.2	8.7%
74	88	NYNEX	495.0	430.0	15.1%	13,211.0	3.7%
75	92	Acer	493.7	379.4	30.1%	698.1	70.7%
76	83	AST Research	482.0	459.0	5.0%	482.0	100.0%
77	91	Science Applications	479.0	386.0	24.1%	1,020.0	47.0%
78	81	Wyse	452.3	456.6	-0.9%	452.3	100.0%
79	146	Dun & Bradstreet	450.0	200.0	125.0%	4,322.0	10.4%
80	107	Ernst & Young	450.0	178.0	152.8%	3,900.0	11.5%
81	103	Maxtor	447.2	339.0	31.9%	447.2	100.0%
82	100	Kodak	445.0	350.0	27.1%	18,398.0	2.4%
83	95	SD-Scicon	431.5	366.4	17.8%	463.4	93.1%
84	111	Novell	429.9	306.8	40.1%	429.9	100.0%
85	112	Mentor	426.4	300.8	41.8%	426.4	100.0%
86	62	Alps	420.4	526.7	-20.2%	2,899.1	14.5%
87	108	3Com	413.9	309.9	33.6%	413.9	100.0%
88	113	Everex	402.0	329.9	21.9%	402.0	100.0%
89	101	Sligos	400.7	343.1	16.8%	400.7	100.0%
90	87	MAI Basic Four	397.0	443.3	-10.4%	397.0	100.0%
91	N/A	Quantum	394.2	172.5	128.5%	394.2	100.0%
92	93	Shared Medical	390.0	378.7	3.0%	390.0	100.0%
93	128	Dell	388.6	257.8	50.7%	388.6	100.0%
94	114	Mitac	380.0	293.3	29.6%	380.0	100.0%
95	94	Sema Group	378.6	375.1	0.9%	479.2	79.0%
96	109	Tandon	377.9	309.3	22.2%	377.9	100.0%
97	127	Kyocera	366.4	258.5	41.7%	2,454.8	14.9%
98	119	Boeing	359.2	274.0	31.1%	20,276.0	1.8%
99	85	Norsk Data	358.1	450.2	-20.5%	358.1	100.0%
100	102	Concurrent	344.6	342.0	0.8%	344.6	100.0%

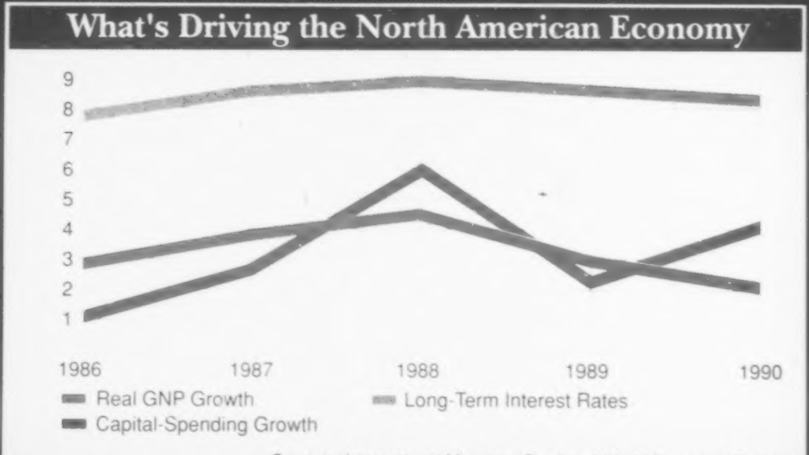
N/A = Not available or not applicable
Revenue figures are in millions of dollars.

THE DATAMATION 100

			R&D				
1989 EMPLOYEES	% EMPL. CHANGE FROM 1988	IS REV. PER EMPL. ($ THOU.)	CORP. 1989	AS % OF TOT. REV.	NET INCOME	% RETURN ON SALES	FISCAL YEAR END
3,200	-5.3%	270.8	23.5	2.7%	8.3	1.0%	June
8,200	12.3%	104.9	91.4	10.6%	79.5	9.2%	December
104,000	2.0%	92.5	784.0	8.1%	498.0	5.2%	December
N/A	N/A	N/A	N/A	0.0%	N/A	0.0%	December
22,000	5.8%	142.1	365.1	11.7%	391.0	12.5%	December
4,708	-10.1%	166.7	143.3	18.3%	89.0	11.3%	December
2,500	-16.2%	307.7	73.0	9.5%	97.7	12.7%	May
292,000	-2.0%	186.9	3,931.0	7.2%	12,900.0	23.6%	December
1,647	0.2%	622.0	N/A	0.0%	125.3	12.2%	June
5,200	N/A	135.6	39.7	5.6%	41.5	5.9%	December
87,500	6.2%	137.0	784.0	6.5%	1,244.0	10.4%	December
244,418	N/A	79.7	367.2	1.9%	2,767.4	14.2%	April
38,600	17.0%	82.7	N/A	0.0%	30.0	0.9%	December
5,459	11.1%	121.4	29.9	4.5%	12.5	1.9%	December
107,542	7.5%	232.9	N/A	0.0%	1,157.0	4.6%	December
82,500	-5.0%	119.9	N/A	0.0%	2.0	0.0%	December
73,854	-1.5%	88.3	506.0	7.8%	252.8	3.9%	December
33,700	5.3%	85.9	202.8	7.0%	N/A	0.0%	March
1,145	1.6%	494.3	N/A	0.0%	17.0	3.0%	December
2,806	9.5%	198.1	94.3	17.0%	68.0	12.2%	December
3,148	21.2%	171.5	N/A	0.0%	12.9	2.4%	August
5,518	-0.7%	94.2	44.4	8.5%	30.7	5.9%	September
65,500	-3.0%	88.5	191.6	3.3%	306.9	5.3%	December
95,400	-2.1%	138.5	218.4	1.7%	808.0	6.1%	December
5,540	9.2%	126.0	665.0	95.3%	151.0	21.6%	December
2,302	13.7%	209.4	16.4	3.4%	11.4	2.4%	June
11,500	16.4%	88.7	4.6	0.5%	30.3	3.0%	February
3,000	-6.3%	150.8	32.5	7.2%	-21.2	-4.7%	March
70,000	1.4%	61.7	N/A	0.0%	586.0	13.6%	September
N/A	N/A	55.7	N/A	0.0%	N/A	0.0%	December
4,400	37.5%	101.6	N/A	0.0%	13.9	3.1%	March
137,750	-5.2%	133.6	1,253.0	6.8%	529.0	2.9%	December
5,400	-1.8%	85.8	N/A	0.0%	5.1	1.1%	December
1,812	5.0%	237.3	42.9	10.0%	52.6	12.2%	October
2,500	47.1%	170.6	64.5	15.1%	45.5	10.7%	December
N/A	N/A	N/A	11.6	0.4%	3.6	0.1%	March
1,880	20.4%	220.2	42.5	10.3%	25.4	6.1%	May
2,200	22.2%	182.7	22.8	5.7%	22.7	5.6%	July
4,032	N/A	99.4	19.7	4.9%	21.0	5.2%	December
3,700	-13.7%	107.3	10.0	2.5%	-40.0	-10.1%	September
640	16.4%	615.9	23.3	5.9%	41.3	10.5%	March
3,903	1.1%	99.9	34.4	8.8%	23.1	5.9%	December
1,508	25.7%	257.7	16.9	4.3%	5.1	1.3%	February
N/A	N/A	N/A	13.3	3.5%	23.0	6.1%	December
6,500	1.6%	73.7	N/A	0.0%	16.8	3.5%	December
750	-49.5%	503.9	10.9	2.9%	-4.3	-1.1%	December
19,242	56.4%	127.6	95.3	3.9%	214.9	8.8%	March
164,546	7.5%	123.2	754.0	3.7%	973.0	4.8%	December
2,941	-29.4%	121.8	36.2	10.1%	-60.4	-16.9%	December
3,090	-10.4%	111.5	40.3	11.7%	-13.3	-3.9%	June

Banks and other financial institutions still are big IT spenders.

If U.S. workers aren't properly educated, employers may be forced to rely more on IT.



What's Driving the North American Economy

Sources: International Monetary Fund and World Economic Outlook

THE DATAMATION 100

A shortage of critical technology has slowed IT demand.

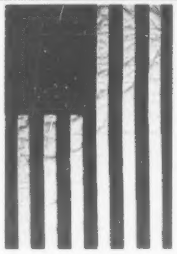
The U.S. market for information systems appears to be taking a back seat to other world regions, judging from research data. But chief information officers at U.S. corporations tell a different story.

What's Right With the U.S. Market

Although sluggish U.S. demand for information technology catches much of the blame for the computer industry's current woes, there is in fact an enormous need for certain types of IT that's largely going unmet. Standards-based computers, networks and software that would enable users to distribute processing across their enterprises are in short supply. The reason such demand isn't being met is immaturity. Suppliers and users of IT just haven't grown up enough to fully cooperate on developing products and services that will achieve enterprisewide objectives.

The need—identified by DATAMATION in scores of interviews with top IS executives in the United States—suggests a far different demand picture for IT than the one painted in

BY RALPH CARLYLE



economic forecasts or even in our own quantitative research findings. In this year's DATAMATION 100 analysis, for example, U.S. users come across as far less voracious in their appetite for technology than do their counterparts in Western Europe and the Far East.

These numbers and those churned out by economists, although useful in many other respects, belie the need expressed by users for distributed-computing components, such as networked workstations, that can be adapted easily to their businesses. "Everything is changing. And we need technology that reflects that fact," says Fran Dramis, chief information officer and a managing director at Salomon Brothers Inc. in New York City. The financial services firm is investing huge sums in computers that can be plugged in and pulled out at will as the firm's business changes. Much of Salomon's IT investment is going toward machines built with reduced instruction set computing (RISC) architectures and the UNIX operating system.

Worse yet, economic and research data—if used or interpreted improperly—can alter the behavior of U.S. users in a way that will come back to haunt them as they struggle to compete in global markets. Such data can turn users away from making the IT investments needed to drive revenues and productivity upward.

Here, then, is a view of IT demand as it really exists in the United States today. It's one that does not discard quantitative analysis, but rather seeks to represent it in the proper context. It's also one that examines new ways of measuring returns on IT investments—gauges that, if embraced by U.S. users, may drive revenues of DATAMATION 100 companies to new heights.

Economists agree that the U.S. economy this year will flirt with, but not enter, a recession (defined as two consecutive quarters of negative growth in the overall economy). They expect the country's gross national product (GNP) to grow at around 2% in 1990, down from 2.9% in 1989. Given this slower growth, and after factoring in interest rates, patterns in business equipment purchases and government spending, the U.S. Department of Commerce predicts that hardware shipments by U.S. suppliers will increase by only 4% this year to $73 billion. A separate agency study estimates that the U.S. market for software will grow around 18% to $27 billion in 1990.

Where the U.S. Economy Is Headed

There's also consensus that GNP growth will expand to 3% in 1991, when interest rates are expected to have eased a point or so to the 9% range. Such favorable economic factors, coupled with the beginning of a new product cycle for large-scale systems for IBM and its competitors, will drive IT demand by U.S. users back up, Commerce Department officials and others believe. Cahners Economics forecasts a 16% jump in U.S. computer and office equipment purchases next year, coming off a mild increase (6%) this year.

But do these economic indicators really show what is happening to IT? Only partly, in the eyes of many top information systems (IS) executives. "They are what you might call trailing edge indicators," says Robert J. Olsen, director of strategic information

North American Leaders

Companies in North America with the highest IS revenues

N. AMER. RANK	WORLD RANK	COMPANY	IS REVENUE ($ MILLIONS)	N. AMER. RANK	WORLD RANK	COMPANY	IS REVENUE ($ MILLIONS)
1	1	IBM	60,805.0	24	45	Andersen Consulting	1,225.7
2	2	Digital	12,936.7	25	47	Northern Telecom	1,150.0
3	5	Unisys	9,390.0	26	49	StorageTek	982.5
4	7	Hewlett-Packard	7,800.0	27	50	Microsoft	952.8
5	11	Apple	5,372.3	28	51	Commodore	866.5
6	12	NCR	5,319.0	29	52	Intergraph	860.1
7	16	Compaq	2,876.1	30	53	Motorola	860.0
8	17	AT&T	2,865.0	31	55	Intel	812.0
9	20	Xerox	2,790.0	32	56	Cray	784.7
10	21	Wang	2,697.0	33	57	Oracle	769.3
11	23	EDS	2,477.9	34	58	General Electric	740.0
12	26	Amdahl	2,101.0	35	60	Conner Peripherals	704.9
13	27	Sun	2,062.5	36	61	3M	696.4
14	31	Tandy	1,892.0	37	63	Black & Decker	687.6
15	34	Seagate	1,797.0	38	65	American Express	660.0
16	35	Control Data	1,691.0	39	66	Lockheed	590.0
17	36	ADP	1,689.5	40	67	Texas Instruments	585.0
18	37	Tandem	1,676.8	41	70	Lotus	556.0
19	38	TRW	1,643.0	42	71	SHL	539.8
20	39	Prime	1,520.0	43	73	Martin Marietta	502.2
21	41	CSC	1,442.8	44	74	NYNEX	495.0
22	43	Data General	1,296.5	45	76	AST Research	482.0
23	44	Computer Associates	1,290.1	46	77	Science Applications	479.0

systems at the University of Texas' MD Anderson Cancer Center in Houston. "They don't measure the leading edge, the things we are getting into or trying to get into, such as network computing." The popular single-digit indicators of IT growth are only a reflection, in Dramis' words, "of the hardware past the industry is dragging along, not the future it's trying to build."

Client/Server Systems Soar

Other observers insist that looking at IT demand as a whole is misleading. "You must always ask: "Which IT industry are we talking about?' " says Mark D. Stahlman, a securities analyst at Alex. Brown & Sons Inc. in Baltimore. "There are many, just as there are many types of IT budgets."

The economists are right in saying that mainframes, minicomputers and stand-alone PCs are mature, Stahlman believes.—that is, exhibit single-digit growth. "But networked workstations, client/server configurations and software are booming," Stahlman says. "They are the new world of demand that is emerging."

"Clients" are any intelligent desktop systems capable of running a robust application in concert with a server, whether it be a dedicated print- or file-server or a minicomputer or mainframe acting in such a capacity.

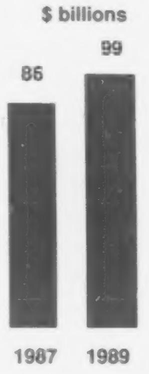
Workstation shipments by U.S. manufacturers should increase 40% in 1990 to $9 billion and nearly quadruple in value to $24 billion during the next five years, according to the Department of Commerce. Masking this explosive growth, of course, is the stodgy overall average for the industry.

For, while the overall economic indicators suggest a maturing industry and overcapacity, Stahlman and others are convinced that the major problem with the IT industry is actually undersupply. "Users have spent roughly $100 billion to $150 billion worldwide on PCs in retraining professional workers to perform tasks previously carried out by clerk-typists," Stahlman points out. "But that's not the type of productivity they are after." What corporate IT buyers in the United States want to do is leverage the productivity of some 40 million professional workers (including managers, sales and technical personnel). But the nature of the work they do, he explains, is an open-ended network of tasks and relationships that calls for much more sophisticated network-based technologies than are currently available in the commercial arena.

Such technologies have already surfaced in embryonic form in the technical and manufacturing arenas, where they are employed in the group-oriented processes of product design and the integration of design with manufacturing and distribution.

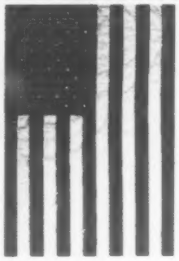
Competition Drives IT Investments

Such group-oriented "social computing"—so named because it is applied to a broad matrix of information-based social interactions—will become a major feature of the office landscape from 1993 onwards, in Stahlman's estimation, anchoring explosive growth in the IT industry. He expects annual sales of social-computing components to reach $50 billion by the end of the decade, building up to an installed base of systems worth $200 billion.



North America spent $99 billion on IS in 1989, up 15% from 1987.

N. AMER. RANK	WORLD RANK	COMPANY	IS REVENUE ($ MILLIONS)
47	78	Wyse	452.3
48	79	Dun & Bradstreet	450.0
49	80	Ernst & Young	450.0
50	81	Maxtor	447.2
51	82	Kodak	445.0
52	84	Novell	429.9
53	85	Mentor	426.4
54	87	3Com	413.9
55	88	Everex	402.0
56	90	MAI Basic Four	397.0
57	91	Quantum	394.2
58	92	Shared Medical	390.0
59	93	Dell	388.6
60	96	Tandon	377.9
61	98	Boeing	359.2
62	100	Concurrent	344.6
63	101	Silicon Graphics	343.0
64	102	Atari	342.0
65	103	Stratus	341.3
66	104	Dataproducts	328.0
67	108	Bell Atlantic	320.0
68	110	Micropolis	307.3
69	111	Gerber	306.1
70	112	Price Waterhouse	305.0
71	113	Datapoint	299.0
72	115	McDonnell Douglas	290.5
73	116	Tektronix	281.8
74	117	WordPerfect	281.0
75	119	National Data	275.7
76	120	Policy Management	265.6
77	121	Ashton-Tate	265.3
78	122	Bolt, Beranek & Newman	257.0
79	123	Recognition Equipment	248.6
80	125	Diebold	243.8
81	126	Genicom	238.7
82	127	Reynolds & Reynolds	236.1
83	128	Computer Task Group	233.0
84	129	Pansophic	232.0
85	130	American Management	225.3
86	132	Commerce	215.8
87	135	Digital Communications	213.5
88	136	Systematics	206.7
89	137	Ultimate	206.5
90	138	SAS Institute	205.6
91	139	HBO	203.6
92	140	General Datacom.	201.2
93	141	ASK Computer	186.0
94	142	Network Equipment	181.3
95	143	Sterling Software	180.2
96	144	Autodesk	178.6
97	146	Cincom Systems	171.1
98	147	Convex	158.6
99	148	Network Systems	144.8
100	149	Cadence	142.8



Big Exporters in North America

The North American companies with the most IS sales outside their home markets

	1989 RANK	COMPANY	IS REVENUES N. AMER.	EUROPE	ASIA	OTHER
1	1	IBM	26,146.2	21,281.8	9,120.8	4,256.4
2	2	DEC	5,950.9	4,915.9	1,940.5	129.4
3	5	Unisys	4,788.9	2,723.1	1,220.7	657.3
4	7	HP	3,744.0	2,886.0	780.0	390.0
5	12	NCR	2,234.0	1,702.1	1,063.8	319.1
6	11	Apple	3,438.3	1,235.6	644.7	53.7
7	16	Compaq	1,553.1	1,179.2	115.0	28.8
8	21	Wang	1,375.5	836.1	377.6	107.9
9	20	Xerox	1,506.6	892.8	83.7	306.9
10	27	Sun	1,093.1	515.6	453.8	0.0

Revenue figures are in millions of dollars.

Right now, U.S. users like American Express Co. and Salomon Brothers are at the leading (and, perhaps, bleeding) edge in pursuing their social-computing systems strategies. These often risky investments are being made at a time of slow growth in the economy and don't reflect the notion currently gaining popularity with economists that the economy and IT spending move in step, or "As with the economy so with IT." But, then, CIOs don't buy this notion, anyway.

"If there is a parallel in any year between what the economy is doing and what the IT business is doing, it's probably coincidental," says Phil Jordan, CIO and vice president of finance at Muzak L.P. in Seattle, the folks whose tunes are heard in elevators, dentists' offices and elsewhere. "Companies will invest in the face of a recession or to catch up with the competition or distance themselves from the competition. Every company has its own dynamics and its own special reasons for buying IT."

There are exceptions, of course—users whose IT investments definitely are a function of economic variables. The health care industry is one. "Hospitals often have to be reimbursed by the state for their services. And if the state is in an economic mess, they don't get reimbursed," says the University of Texas' Olsen.

Where competitive strategies do drive IT investments—the rule, in most cases—the risk for riding on the edge of technology doesn't just fall on the shoulders of IS executives. Sharing the burden—and, of course, the credit if IT investments pay off—are an increasing number of other individuals in the business units who also specify and buy IT products.

Fast Trackers in North America

The companies that grew the most in IS in 1989

	1989 RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	% INCREASE
1	71	SHL*	539.8	195.0	176.9%
2	80	Ernst & Young*	450.0	178.0	152.8%
3	91	Quantum	394.2	172.5	128.5%
4	79	Dun & Bradstreet*	450.0	200.0	125.0%
5	57	Oracle	769.3	394.9	94.8%
6	93	Dell	388.6	257.8	50.7%
7	65	American Express*	660.0	446.9	47.7%
8	85	Mentor	426.4	300.8	41.8%
9	27	Sun	2,062.5	1,461.6	41.1%
10	84	Novell	429.9	306.8	40.1%

* Growth partly due to merger or major acquisition
Revenue figures are in millions of dollars.

Respondents on this year's DATAMATION budget survey guessed that an average of almost 34% of their IT purchases in 1989 had been made outside the IS organization, 42.5% in the public sector. Diane L. Lockwood, an associate professor of MIS at Seattle University refers to such spending as "offline" and says it usually appears under decentralized departmental budgets and so is difficult to keep track of and often does not get included in estimates of IT spending.

"End-user spending has been growing . . . [probably] at the 15 or 20% growth level, but it's difficult to know for sure," says Raymond Wiltshire, vice president of computer-aided productivity at Martin Marietta Corp. in Bethesda, Md. "The only thing we know for sure is that business units are always spending more on IT than we think they are."

The result? Few user organizations in the United States have any idea what they are really spending on IT. Most are in the dark as to how these expenditures relate to their overall productive capacity or the economy as a whole. They just don't know whether technology is helping to write a better insurance policy, produce a more accurate debit/credit statement, bring a toy to market quickly or create a car worth driving.

Why Ignorance Isn't Bliss

This ignorance is a result of what one top European consultant calls a fragmentary view of IT, which is most pervasive in the United States. Paul Reynolds has worked with U.S. companies, but mostly provides advice on problem solving and decision making to the boards of such top European establishments as British Petroleum, Daimler-Benz and Royal Dutch Shell. He, and the company he heads, Wentworth Management Consultants Ltd. in London, also counsels governments. His European clients have taken the trouble to find out how IT relates to and could improve all of their economic activity, not just portions of it. "Shell, for example, now knows that 6.3% of all its economic activity is IT-related," Reynolds says. "Many American com-

Top Performers in North America

The companies with the highest returns on sales

	1989 RANK	COMPANY	1989 % RETURN ON SALES	1988 % RETURN ON SALES
1	50	Microsoft	22.1%	21.1%
2	57	Oracle	12.7%	18.5%
3	84	Novell	12.2%	11.3%
4	70	Lotus	12.2%	12.6%
5	36	ADP	11.6%	11.0%
6	16	Compaq	11.6%	12.4%
7	56	Cray	11.3%	20.7%
8	85	Mentor	10.7%	11.1%
9	91	Quantum	10.5%	(1.4)%
10	44	Computer Associates	10.3%	15.4%

panies would be hard pressed to come up with such a measure."

U.S. users have been content to measure IT's contribution to corporate performance in other ways. For example, IT spending is often expressed as a percentage of total sales: 2 to 5% of total sales is normal, depending on industry. Expressed as a percentage of total general expenses, IT accounts for some 4 to 10%, again depending on the industry. Then there's IT as a percentage of discretionary capital expenditures: here anything from 30 to 40% is today the norm.

"How much of this is really useful?" wonders Reynolds. "Isn't it better to have a measure of IT that relates to all spending and all a company's economic activity? . . . Surely, until we do this, we don't know what demand for IT really is. We don't know what we're talking about."

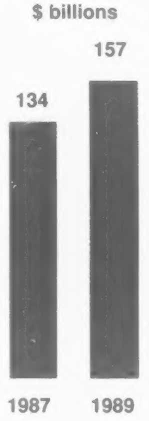
If U.S. companies do develop new, more embracing measures for IT, Reynolds predicts that industry growth will surge. "The IT budgets of these companies will climb as they become more aware of what their true needs are," he says. Some of his clients, he claims, have been increasing their budgets by as much as 35%. Much of this investment has gone toward the creation of an open systems technology infrastructure, which can adapt quickly to changing world conditions.

Aside from ignorance, Reynolds believes, the biggest drag on IT spending may be the IS budget itself, because funds within it are still viewed by many chief executives as overhead. "When Shell's Belgium subsidiary decided to get rid of all its internal IT resources, its budget was growing at around 15% a year. Since farming everything out, IT-related expenditures have increased 75%," he reveals.

Where Open Systems Suppliers Excel

A study of his European clients has also brought to light another interesting fact, says Reynolds. Only 15% of their total hardware/software budget for new applications is being spent on products and services offered by the world's top 20 suppliers. The rest is being spent on goods sold by an array of small, unsophisticated but very innovative companies.

Reynolds' message is also being echoed by a small, but growing number of U.S. users—notably in manufacturing and in the brokerage and accounting



North American IS sales have risen 17% since 1987.

Why IT Is a Factor of Production

Matching the demand of goods and services with the supply of them has become information technology's role in the 1990s, as global competition places a premium on efficiency.

In the good old days—when money was cheap, labor plentiful and markets undisturbed by foreign rivals—producers could get away with managing and coordinating the flow of their goods throughout the Western economy using only people and paper. Moreover, their customers were content to wait weeks for new orders to be filled—relying on massive inventories of products already shipped to them. But population growth is slowing, the number of skilled workers is diminishing and the cost of money is rising. Competitors are everywhere. And customers are impatient—they want everything yesterday.

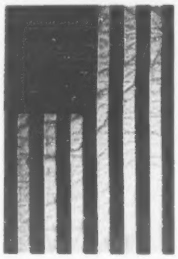
"If you can't get cheap labor or cheap money, what's left?" asks Everett Ehrlich, vice president of finance and economic planning at Unisys Corp. in Blue Bell, Pa.

What's left, of course, is information technology—as Japanese corporations have so ably demonstrated. In the 1960s, when faced with labor shortages and rising wages, Japan's leading manufacturers invested heavily in IT, and in the process achieved wide gains in productivity.

What the Japanese and others have learned, says Ehrlich, is how to make information (and, by association, IT) a vital factor of production. "IT has become substitutable for labor and capital, or alternatively allows labor and capital to be more productive," the Unisys executive says.

Faced with overseas competition, high interest rates and a tight labor market, U.S. manufacturers have had to learn the same lesson. Since the current U.S. economic expansion began in late 1982, design and manufacturing processes integrated through IT have become the order of the day. The economy is beginning to reflect this shift. "The ratio of inventory to sales has gone down continually since 1982," says Cynthia Latta, senior financial economist at Data Resources Inc.

"Inventory behavior is now completely different in the U.S. [than it used to be]," says Raymond Wiltshire, chief information officer and vice president of computer-aided productivity at aerospace manufacturer Martin Marietta Corp. "There are no longer the inventory overhangs that are emblematic of the end of the business cycle. We're beginning to bust the business cycle."



sectors of the financial services industry. These users are investing in new networked-computing infrastructures—technology conduits that move critical data to all relevant decision makers at high speed and disseminate changes throughout the firm. The infrastructure includes everything from the workstation on a professional's desk to the network facilities and the collection of servers, hosts and database resources.

"Our infrastructure is like a puzzle to be put together as we conduct our business, and [it is] rearranged each day," says Salomon's Dramis. "Only the open systems vendors and the young, innovative companies seem to understand this."

Dramis and the others have discovered that what they are really demanding is technology that is "everywhere and nowhere," in the words of best-selling author Tom Peters, addressing executives at a recent forum of CIOs gathered together by the accounting firm Coopers & Lybrand. The industry is too immature yet to deliver it, and nobody, least of all the economists and IT budget makers, has yet found a way to measure it.

One shouldn't blame the economists. They agree with Reynolds that their assumptions are based on incomplete data, but they say the onus is on the corporations to express demand in new and more comprehensive ways.

"Only consumers tell the story of what IT demand truly is," says Madeline Franchi, a senior economist at Cahners Economics in Newton, Mass. "If they express it as overhead, or as a percentage of costs or capital, then that's all we have to go on."

Franchi and Cynthia Latta, senior financial economist at the Lexington, Mass.-based macroeconomics research house Data Resources Inc., say they are both comfortable talking about the economy as a whole, but not its impact on IT or vice-versa. "I simply don't know," says Latta, candidly. "It's easy to see why." ▭

In the Red

The companies that lost money

	1989 RANK	COMPANY	1989 EARNINGS LOSS ($ MIL.)
1	35	CDC	(680.4)
2	5	Unisys	(639.0)
3	21	Wang	(511.0)
4	39	Prime	(276.8)
5	43	Data General	(120.7)
6	99	Norsk Data	(60.4)
7	28	Memorex	(54.2)
8	8	Groupe Bull	(41.8)
9	90	MAI Basic Four	(40.0)
10	78	Wyse	(21.2)

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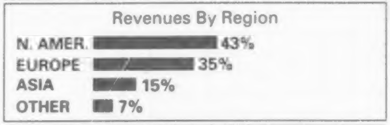
IS Revenues: $60.81 Billion

REGION **1** **IBM** WORLD **1**



INTERNATIONAL BUSINESS MACHINES CORP.

Old Orchard Road
Armonk, NY 10504
(914)-765-1900

Increased competition and a broad slowdown in the information technology industry challenged International Business Machines Corp. in 1989. The world's largest computer company responded with a strategy that involved cutting costs, focusing on global opportunities and pushing employees to respond better to users' needs.

The strategy may pay off this year or next, but it exacted a price last year. Profits at IBM plunged 35% to $3.8 billion in 1989—chiefly because of the company's decision to write off $2.3 billion against earnings in its fourth quarter to reflect restructuring and other charges.

Revenues worldwide for IBM did grow 5% to $62.7 billion in 1989. Sales in the United States increased for the first time in four years—a modest 2% to $25.7 billion. The company's strongest growth, however, continues to come from Asia, Europe, Central America and South America. Revenues from those regions now account for 59% of IBM's sales—up from 43% in 1985.

IBM CEO John Akers stresses cutting costs and customer needs.

IBM's European revenues grew 7.3% in calendar 1989, not quite as good as its 10.3% growth in the year before. However, in local currencies, the growth rate was really closer to 15%. To make sure its overseas revenues continue to grow, IBM has made some management changes, including giving general managers within countries global responsibility for serving key customers that operate multinationally.

Overall, IBM believes the industry should grow 8 to 10% in 1990. If it does, says IBM chief financial officer Frank Metz, the company should be able to boost its revenues this year in every product area and in every geographic area, including the United States. If IBM's performance in the first quarter of 1990 is any indication, Big Blue may indeed achieve its growth objectives. IBM's earnings climbed 9% to $1 billion on revenues that grew 11% to $14 billion in the first quarter of this year. Moreover, the company also achieved double-digit sales growth in the United States.

IBM is improving its fortunes in a variety of ways. For one thing, the company is trimming its employee ranks through attrition and early retirement. By the end of this year, the firm will have reduced its U.S. work force by 15% to some 200,000 workers. IBM also is ratcheting up efforts to provide answers to its customers' problems via a better-educated and -compensated sales force. And Big Blue is backing away from noncore businesses: last year the company completed the sale of its Rolm communications equipment development and manufacturing operation to Siemens AG.

In addition, IBM has broadened its market horizons, expanding into new businesses such as systems integration and facilities management. IBM also joined forces with independent software vendors like Atlanta-based Management Science America Inc. (now merged into Dun & Bradstreet Software), which agreed to develop products for IBM's OfficeVision integrated office automation suite of products. By the end of 1989, IBM had made equity investments in MSA and 74 other industry partners.

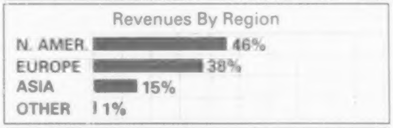
IBM's efforts to expand into new businesses produced mixed results in 1989. On the positive side, the company did manage to drum up some major new business from customers such as Eastman Kodak Co., which decided to turn much of its data center operations management and applications development over to Big Blue. On the negative side, IBM officials acknowledge that revenue growth from the company's software business has been slower than expected despite the solutions push. And profit margins on both software and services have been slipping.

Software revenues at IBM were up only 6.3% in 1989, reflecting a continuing user trend toward data center consolidation. IBM last year saw its fastest revenue growth in personal systems and 3090 mainframe systems, although its overall processor business climbed only 7% for the year. Personal systems revenues streaked up by 19%, and the 3090 enjoyed double-digit sales growth and improved margins. IBM's revenues from peripherals and maintenance were down by 2.3% and 3.8%, respectively, in 1989.

New products such as the 3390 large disk drives and RISC System/6000 workstations figure to improve IBM's revenues in peripherals and workstations in 1990. The company's new cost structure (fewer employees) figures to raise profits, and its new business relationships should ensure software development for IBM systems. But IBM's ability—versus that of its competitors—to respond to user needs in the 1990s will be what really determines the company's financial figures in the future. *—Jeff Moad*

IS Revenues: $12.94 Billion

REGION **2** **DIGITAL** WORLD **2**



DIGITAL EQUIPMENT CORP.

146 Main Street
Maynard, MA 01754
(508)-897-5111

How you judge Digital Equipment Corp. depends on where you sit.

If you're a neighbor and competitor of the company—seated at a desk at Data General Corp., Prime Computer Inc. or Wang Laboratories Inc.—things don't look all that bad at the world's No.2 computer maker. It didn't lose hundreds of millions of dollars in 1989. The company made money—$875.8 million to be exact. If you're on Wall Street, things look fat at the company—whose revenues per employee are half as much as those of competitors such as Apple Computer Inc.

If you're a customer or a potential one, the company does appear to have the product now, and in many sizes: high-end systems (VAX 9000); midrange systems (VAX 6000); transaction-processing systems (VAXft 3000); a host of low-end systems (VAX 5000, etc.); networking (Ethernet); proprietary (VMS) and open (ULTRIX) operating systems; tens of thousands of software applications; and a fair reputation for service and support. Digital also has a track record. The company last year shipped its 300,000th VAX system—some 12 years after the product family was introduced. In all, about 8 million people use VMS, Digital's proprietary operating system. And the company has size—with calendar 1989 revenues approaching $13 billion.

Sitting midway through 1990 and two weeks away from the close of Digital's fiscal year (June 30), how do things look? Well, hazy. Digital's quarterly earnings slumped 44% as it ended calendar 1989, and its chief, Kenneth Olsen, hinted that his company might actually lose money in the first three months of 1990. It came close, earning only $25 million on revenues of $3.3 billion. Digital's bottom line was reduced by a one-time restructuring charge of $150 million chiefly to cover workers' severance packages. Some analysts expect employee head count reductions on the order of 6,000 workers this year.

Digital's bread-and-butter business, minicomputers, is under competitive fire from workstations, high-performance PCs and versatile local area networks. And its single biggest market, the United States, remains somewhat sluggish.

Olsen appears anything but glum, however. The ideal response to an industry slowdown, says Digital's founder and president, is new products and new directions. And Digital has indeed responded. Branching out beyond the departmental, engineering and factory-floor applications that form its traditional base, Digital introduced so many products and services in 1989 that a list of them consumes 22 pages. And it is keeping up the pace in 1990.

The VAX 9000, Digital's entry into the mainframe market, leads the list of new high-performance products. Orders for the systems, which won't begin shipping in volume until the second half of this calendar year, exceed everyone's expectations. The VAX 9000's penetration outside Digital's traditional customer base, expected to be nonexistent, is proving significant. In a recent survey of DATAMATION subscribers, a full 45% of respondents who intend to buy a VAX 9000 this year or next say they are replacing existing IBM systems with the new DEC mainframe.

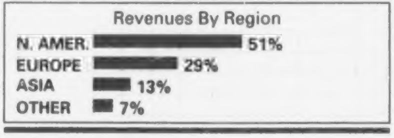
Securities analysts who follow the company are in search of another list, however. They want to know what steps Digital is going to take to reduce its costs. They believe Digital, with total employment of 125,900, is bloated and must inevitably go through the sort of painful reorganization that companies such as Data General and Wang have undergone, reducing their employee ranks by 10 to 25% in 1989.

"We're not doing too bad" is about as much as Olsen will say on the subject of his company's financial condition. Digital is sitting on nearly $2 billion in cash and liquid assets. It's putting more than 10% of revenues into research and engineering. And it's introducing new products practically every week. "Others may be hurting," Olsen says. "We're still generating revenue like crazy."

The question facing Digital is whether it can generate greater and greater amounts of revenue like crazy. Quarterly sales at the company hit their peak a year ago at $3.5 billion. Some analysts, however, expect the company to finish its fourth quarter with a bang—achieving $3.6 billion in revenues. *—Chris Sivula*

IS Revenues: $9.40 Billion

REGION		WORLD
3	**UNISYS**	**5**



UNISYS CORP.
Township Line and
Union Meeting Roads
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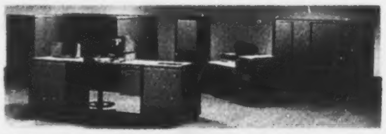
(215)-542-4011


Unisys' mainframes currently account for 30% of total business.

Michael Blumenthal would have liked to end his tenure as chairman and chief executive officer of Unisys Corp. on a high note. He wanted 1989 to highlight all of the strengths of the company he has guided since its formation in 1986. Instead, only the flaws were apparent: bulging inventories and a bloated cost structure that was way out of line with real market demand.

By the third quarter, Unisys was involved in a painful restructuring of its whole operation: 8,000 jobs were cut and inventories slashed, eventually by as much as $700 million. Add to this a continued slump in the company's principal U.S. market (sales were off 4%); big losses in the defense business, which accounts for 25% of revenues; and a major (and expensive) product transition at the top of its mainframe families, and one can begin to see why Blumenthal described his swan song year as "painful," "disappointing" and "trying," each a classic understatement. All told, the company lost a whopping $639.3 million—almost the amount it had gained the year before—and its debt climbed $500 million to nearly $4 billion.

Highlights, if they can be called that, were a modest 2% increase in sales, which pushed Unisys through the $10 billion barrier ($10.1 billion), and an overall 9% increase in international sales, with especially strong showings from the European and Pacific Rim markets. In addition, the new 2200 series large mainframes are now in place and, although late, have been generally well received by customers (if generally ignored by the media because of the company's lowly 7% share of the mainframe business). Because mainframes (including processors, peripherals and software) currently account for 30% of total business, as opposed to the 15% contributed by open systems, the vote of confidence in the big machines was a welcome contrast to the general tone of the year.

Although it was an early leader in UNIX and other open system-based technologies, Unisys in 1989 seemed to be caught napping by the shifting pricing dynamics that such systems have brought to the industry. "The speed [of the shift] did surprise us somewhat," admits the new chairman and CEO, James A. Unruh. "And we realized as we got into the year that we were going to have to make much more substantial changes in our cost structure."

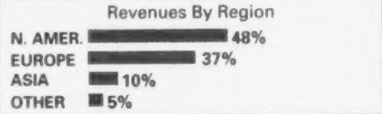
The company was also ill-prepared for sweeping changes in the government and defense sector of its business, particularly changes that Unruh calls "moving cost and risk to its contractors." Last year, the government began to shift research and development projects from cost-plus contracts to a fixed price basis. But Unisys was one of several companies that had large write-offs because of overruns on fixed price contracts. "Now, because of peace breaking out, budgets are under pressure and so are new programs," says Unruh, painting a bleak scenario.

By taking drastic measures in 1989, Unruh believes his company can compete effectively in selected U.S. market sectors such as financial services and retail, when they pick up. Although the company didn't make any money on its burgeoning open systems business or on PCs last year, Unruh says he hopes to in 1990. He also expects moderate single-digit growth for mainframes and for his whole business in 1990. *—Ralph Carlyle*

IS Revenues: $7.80 Billion

REGION		WORLD
4	HEWLETT-PACKARD	7

Revenues By Region



HEWLETT-PACKARD CO.

3000 Hanover Street
Palo Alto, CA 94304
(415)-857-1501

No mainstream information technology supplier has made the move toward distributed computing faster and more completely than Hewlett-Packard Co. The company is enjoying faster growth than most direct computer competitors, and it's encountering a new set of economics.

The benefits and the costs of changing from a U.S. supplier of proprietary minicomputer hosts to a global provider of standards-based desktop systems and peripherals are clearly evident in HP's 1989 financial performance. The company's information systems sales, DATAMATION estimates, grew 24% to $7.8 billion for calendar 1989, representing 65% of its $11.9 billion in corporate revenues. But earnings for the company failed to keep pace—climbing only 2% to $829 million.

The reason is fairly clear: there's less room for profit on sales of personal computers, workstations and peripherals—the source of more than 50% of HP's computer revenues—than on sales of minicomputers. HP's $500 million acquisition of workstation-maker Apollo Computer Inc. also hurt its 1988 bottom line.

HP will be going head-to-head with IBM in the 1990s. The two companies square off in personal computers (HP's Vectra line vs. IBM's PS/2 family); desktop laser printers (HP's LaserJet III vs. IBM's 4019 LaserPrinter); midrange/server systems (HP's 3000 line vs. IBM's AS/400 family); and workstations/servers (HP's 9000 and Apollo systems vs. IBM's RS/6000 series).

Many other companies are offering products based on operating systems like MS-DOS, OS/2 and UNIX. What makes HP any different? "Standards don't mean standardization," says Dean Morton, HP's chief operating officer. HP adds value atop standards, he says, pointing to the company's object-oriented NewWave software.

The biggest indication of just how seriously HP takes distributed computing came earlier this year. In January, the company blitzed the industry with a 24-product rollout designed to reposition its minicomputers from hosts to servers. The company's RISC series—the HP 3000 family, running HP's proprietary MPE operating system, and the HP 9000, running the company's version of UNIX—now have nearly a dozen server models between them.

Adding customers—in key industry segments as well as geographically—may prove a daunting challenge. Manufacturing users currently account for more than 50% of HP's computer sales, and the company is looking to expand into other markets, such as financial services.

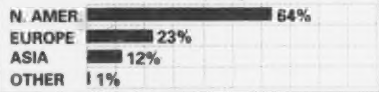
HP will face stiffer competition from the likes of NEC Corp. and Siemens AG as it strives to broaden its international sales beyond their current level—some 52% of HP's business overall. But demand for information systems is growing so fast in Europe and the Far East—30 to 40% a year by Morton's estimates—that HP has little choice but to attack globally.

As HP attacks new geographic, industrial and technological markets, it must discipline itself financially. Many of these new markets are best served through distribution channels other than direct sales—meaning that HP must accept narrower profit margins. Many require fast time to market and technologically sophisticated products—meaning that HP must continue to allocate nearly 11% of its revenues to research and development. Given these dynamics, it's likely that HP will continue to consolidate manufacturing activities and cap employee ranks at 95,000. *—Tim Mead*

IS Revenues: $5.37 Billion

REGION		WORLD
5	APPLE	11

Revenues By Region



APPLE COMPUTER INC.

20525 Mariani Avenue
Cupertino, CA 95014
(408)-996-1010

By most yardsticks, Apple Computer Inc. performed exceedingly well during 1989. Despite an overall slowdown in the personal computer industry, Apple reported a 21% increase in net sales for its fiscal year and unveiled several new Macintosh models with impressive communications capabilities. The company also nurtured a strong financial position, represented by reserves of $809 million, a return on equity of 36% and no debt.

But the good news on revenues was offset by a disappointing 4.5% growth in earnings for calendar 1989, compared with a 50% leap in calendar 1988. In December, Apple's stock dipped following pessimistic earnings projections from several investment houses and reports that Apple's 9% penetration of the business market had stalled.

The resignation of Apple USA president Allan Z. Loren soon followed, along with the shutdown of one of three U.S. distribution/support centers as part of a cost-cutting program. A decision by the General Accounting Office to review a major Air Force contract that Apple received through Honeywell Inc. also didn't help.

Despite the company's troubles, international sales jumped 41% over the prior year to represent 36% of total net sales. The company also boosted research and development expenditures to $416.4 million, nearly 8% of sales. Such investment helped Apple blitz the industry with a series of new products, including the Macintosh Portable. "We really tried

DATAMATION 100

to focus heavily on the midrange of our product line," says Morris Taradalsky, Apple's vice president of customer service and information technology.

Increasing competition led many to question Apple's pricing and product mix strategies for both the business and home markets. For example, 1989's push to extend the Macintosh upward left an obvious vacuum at the low end of the market, where Apple reported disappointing Christmas sales for both the four-year-old Macintosh Plus and the aging Apple II family. Both systems had previously sold well into homes, schools and small businesses.

"Senior Apple executives did not agree as to the product and market directions in 1989," says Ash Jain, vice president of client services at Irvine Resource Group Inc., a research group in Irvine, Calif. "What was obvious in 1984 and 1985—that the market demanded an open Macintosh—was not at all obvious last year."

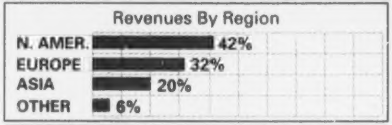
A clearer picture may begin to emerge in 1990, however, with chief executive officer John Sculley taking personal charge of Apple's new product activities. The appointment of Michael Spindler, formerly president of Apple Europe, to the position of chief operating officer, should also bode well for the company. With the architect of Apple's impressive European sales effort now heading up the worldwide marketing and manufacturing, Jain believes that Apple will regain a market-driven approach similar to what led to its 1985 turnaround.

While many Apple customers remain loyal, most see room for improvement in the pricing arena. "We would like to see a low-cost, modular, NuBus-based Mac in 1990," says Alan Soucy, manager of computing standards at Martin Marietta Information Systems Group in Chantilly, Va. For 1990, Soucy looks forward to the delivery of Apple's System 7.0 software, which will improve Macintosh performance without forcing customer migration to new hardware.

Apple has always shown remarkable resilience weathering the hard times. Considering the company's key assets—loyal users, an impressive software selection and considerable financial strength—cautious optimism seems warranted. Says Apple's Taradalsky: "One great thing about Apple is that it recognizes the importance of change. Unlike some companies, Apple can change very quickly." —*Paul Pinella*

IS Revenues: $5.32 Billion

REGION		WORLD
6	NCR	12



NCR CORP.

1700 South Patterson Boulevard
Dayton, OH 45479
(513)-445-5000

In recent years, NCR Corp. has remade itself into a company known for its PCs and open systems. Shunted to the background was NCR's image as a stodgy purveyor of cash registers and bank-accounting machines. But in 1989 it was the NCR of old that kept this company on an even keel.

NCR's seasoned management can take much of the credit for keeping the company reasonably healthy in what was basically a down year. For calendar 1989, sales of NCR's information systems products (excluding business forms, semiconductors and micrographics) were essentially flat at $5.3 billion, and while earnings dropped 6% to $412 million, the decline owes a good deal to the $500 million NCR spent buying back its own stock.

Compared with Digital Equipment Corp., IBM and Unisys Corp., NCR sailed through 1989 with remarkable aplomb. The company concentrated on expense control, reducing its work force by 5% and cutting back inventory and working capital by some $200 million.

Like other IS vendors, NCR is suffering from the slowdown in financial services. "There isn't a lot of excess capital lying around," laments Mike Gibson, an NCR assistant vice president for branch automation in financial and office systems.

But NCR isn't taking it lying down. In what has been largely a replacement market for automated teller machines (ATMs), NCR has added enough bells and whistles to steal market share from industry leader Diebold Inc. And NCR also did well with its retail point-of-sale systems, signing up Burger King and Kentucky Fried Chicken for big orders.

Sales of these industry-specific workstations now account for a quarter of NCR's IS revenues—up from only 20% a few years ago—and provide a steady stream of business helping to offset flat sales in other IS lines and a 13% drop in NCR's once fast-growing PC business.

NCR shook up its PC unit and other divisions as part of a companywide reorganization that placed its 11 different product development units under two big umbrella groups: the Integrated Systems Group, focused on end-user products, and General Purpose Products, for value-added resellers and other third-party integrators. At the year's end, NCR introduced a 486 machine using the Micro Channel Architecture, which is being marketed through Businessland Inc.

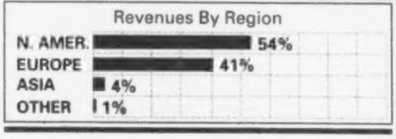
A new companywide emphasis on software should begin to affect the bottom line this year. Richard Barnard, vice president of data processing with The National Bank of Commerce in Charleston, W. Va., says that he is particularly impressed by the Universal Financial System, a new mainframe banking package that NCR introduced last year.

In February of 1990, NCR announced its commitment to developing software and hardware systems consistent with what it calls its Open, Cooperative Computing Architecture (OCCA). Based on a client-server model and using open interfaces based on industry standards, NCR's first OCCA product is Cooperation, a set of office automation software products incorporating Hewlett-Packard Co.'s NewWave technology.

Exley predicts that sales of software developed under OCCA will be a $200 million business for NCR in five years. The biggest impact is likely to be on third-party software suppliers, which until recently may have questioned NCR's open commitment. Now it seems clear: when it comes to open systems, NCR is going all the way. —*Joe Kelly*

IS Revenues: $2.88 Billion

REGION		WORLD
7	COMPAQ	16



COMPAQ COMPUTER CORP.

20555 State Highway 249
Houston, TX 77070
(713)-370-0670

As Compaq Computer Corp. enters its ninth year, it's beginning to take on the patina of the brash, confident minicomputer vendors of the early

1970s. And no wonder. Last November, Compaq elbowed its way into minicomputer territory with the release of the SystemPro, an impressive dual processor network server built around Intel Corp.'s 80386 and 80486 chips. Revenues grew in calendar 1989 by nearly 40% to $2.9 billion, while net income increased 31% from $255.2 million to $333.3 million.

The SystemPro is the most technically complex machine Compaq has ever offered. To pull it off, Compaq worked closely with a number of third-party hardware and software suppliers, including Emerald Systems Corp., a storage products company based in San Diego, and Microsoft Corp., which supplied a special version of its LAN Manager network software to take advantage of the SystemPro's special design.

The SystemPro wasn't Compaq's only 1989 hit. The company also introduced the LTE laptop computer in October, a model that became so popular demand outpaced production well into this year. Although Compaq declined Japanese assistance for previous computer generations, for the LTE it called upon Citizen Watch Co. to provide laptop screen expertise and help in solving some manufacturing problems.

Compaq demonstrated its clout last year when it severed its relationship with one of its major dealers, Businessland Inc. of San Jose. In February of 1989, the company charged Businessland with demanding special treatment over other dealers and with favoring IBM's Micro Channel Architecture machines over Compaq's Extended Industry Standard Architecture (EISA) PCs. In March of this year, the two mended fences. The yearlong rift probably hurt both parties to some extent, but Businessland appears to have suffered most of the damage, reporting lower earnings this year than last.

Businessland-style resellers are just what Compaq needs if it is to continue to outpace the industry's growth rate without incurring the high overhead that mainframe and minicomputer companies have, says Michael Swavely, president of North American operations. "Why should I emulate them, when [overhead is] exactly what they're trying to cut right now?" he asks. Instead, Compaq plans to support its dealer channel and gradually add direct support capabilities for its higher end systems. To that end, says Swavely, Compaq doubled its U.S. training and support budget in 1989.

In March of this year, Compaq opened demonstration centers at four regional offices around the United States, primarily to demonstrate the abilities of the SystemPro. Still, sales will continue to go through the dealer channel.

Meanwhile, Compaq has stepped up its investments in strategic supplier companies, a move similar to its 1988 infusion of $100 million into disk drive maker Conner Peripherals Inc. of San Jose. In early 1990, Compaq took a stake in NexGen Microsystems, a San Jose startup that is developing a high-end chip set offering functionality similar to Intel Corp.'s 80486 microprocessor. The stake in NexGen, said to be between $5 million and $10 million, is seen as an effort to reduce Compaq's dependence on Intel's chips.

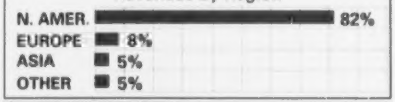
Also this year, Compaq announced a technological agreement with Novell Inc. to work on creating a mirrored server to move its server class of machines into the fault tolerance market. That type of research and development will continue, Swavely says.

The SystemPro, however, represents the first taste of what Compaq sees as the computer company of the 1990s, not bound by appellations such as mainframe, minicomputer, workstation or PC. Says Swavely: "I think what you'll see through the 1990s is a total blurring of traditional boundaries." *—Bob Francis*

IS Revenues: $2.87 Billion

REGION		WORLD
8	AT&T	17

Revenues By Region



AMERICAN TELEPHONE & TELEGRAPH CO.

550 Madison Avenue
New York, NY 10022
(212)-605-5500

After six post-divestiture years of slamming into what at times appeared to be an impenetrable wall in the computer business, AT&T's Data Systems Group began to break through in 1989.

Last year, the Data Systems Group was estimated to have lost about $150 million selling PCs, minicomputers, terminals, software and other data products. But that loss is much less than the $300 million shortfall that had been estimated for 1988. DATAMATION reckons AT&T's total 1989 IS business—including not only the Data Systems Group but also PBXs, modems and other datacom products—at about $2.9 billion, up from $2.4 billion in 1988.

AT&T itself posted $36.1 billion in revenues, up from $35.2 billion, with net income at $2.7 billion, compared with a loss of $1.7 billion in 1988.

The Data Systems Group, which was reorganized last year to include AT&T Computer Systems, UNIX Software Operations and Synchronous Terminal Products, scored big contract wins with American Airlines Inc. and the Federal Aviation Administration and began working on a huge U.S. Air Force contract it won late in 1988.

In June, the company was awarded a $100 million 386-based workstation, server and local area network contract by AA to upgrade the SABRE reservation system. The FAA award, under what is called the Office Automation Technology and Services (OATS) contract, is valued at $853 million over three years. This contract calls for automating certain functions in Department of Transportation offices. Meanwhile, after resolution of a contract protest, AT&T tackled the $929 million Air Force Standard Mulituser Small Computer Requirements contract it won in October 1988. This three-year contract calls for the delivery of 3B minicomputers, networks and systems integration services to the military. In 1989, AT&T also won a $25 million contract from Firestone for PCs, printers and LANs and a $7 million contract from the New York State Department of Health for PCs, printers, 3Bs and modems.

The group was also active on the technology and alliance fronts. In June, AT&T announced that it had sold its stake in Ivrea, Italy-based Ing. C. Olivetti & Co. SpA, its long-time PC supplier, and that Olivetti would no longer be its prime PC vendor. In July, it was announced that AT&T and Intel Corp. would jointly develop PCs, and in January of this year the company said it would also build its own, Intel-based PCs in Little Rock, Ark. From the company's UNIX operation in November came version 4.0, which represented a merger of the Berkeley, XENIX and System V UNIX variants. The 3B2/1000 minicomputer was introduced last year, as well.

In October, AT&T signed an agreement with Pyramid Technology Corp. to jointly develop a line of UNIX-based high-performance computers. AT&T will market the machines, which were formally announced in April, on an original equipment manufacturer (OEM) basis as the System 7000. The company also strengthened its relationship with Sun Microsystems Inc., which has consisted of UNIX development work as well as an equity investment in Sun via joint systems integration work.

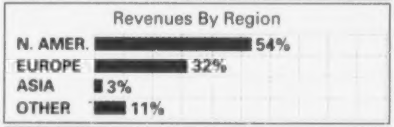
Gordon Bridge, president of the Data Systems Group's Computer Systems unit, says 1989 was a year in which the company's strategy to be a "leader in networked computing solutions" began to pay off. And he says he's very optimistic about 1990. "We have lots of challenges and competition," says Bridge. "[Still,] we're experiencing a substantial growth in business. We're not ordering champagne yet; we're keeping our heads down. It will be nice to put the issue of profitability behind us."

—David R. Brousell

IS Revenues: $2.79 Billion

REGION		WORLD
9	XEROX	20

Revenues By Region



XEROX CORP.
P.O. Box 1600
Stamford, CT 06904
(203)-968-3000

"People respect IBM," observes Bud Caldwell, a Xerox Corp. vice president, "but they like Xerox."

Caldwell should know. He is vice president and general manager of Xerox's Custom Systems Division, its systems integration arm. And he's one of a slew of ex-IBMers now prominent at Xerox, including William C. Lowe, executive vice president in charge of Xerox's Development and Manufacturing Division, and Dennis W. Andrews, vice president of Xerox's systems software unit.

The ex-Big Blue team's mission is to build on Xerox's strength in printers and copiers to make it a presence in corporate publishing and document management. The playbook includes open systems and systems integration.

In the information systems field, Xerox hasn't been able to duplicate its success with copiers. DATAMATION estimates that only 16% of Xerox's $17.6 billion in corporate revenues in calendar 1989 came from sales of printers, workstations and other products and services related to information systems. One reason IS accounts for so little is that Xerox's efforts to design, make and market PCs and workstations have fared poorly. That's why the company decided to migrate its systems to UNIX and the Sun Microsystems Inc. SPARC microprocessor as part of an overall strategy to embrace open systems.

Xerox's IS-related revenues grew only 5% to $2.8 billion last year while its entire document-processing business (including IS) expanded 6% to $12.4 billion. Income from document processing jumped 24% to $488 million. Last year's earnings in Xerox's other main business, financial services, actually declined 9% to $216 million despite a 9% increase in revenues to $5.2 billion. Hurricane Hugo, the San Francisco earthquake and the downturn in the securities business hurt Xerox's insurance and investment-banking profits.

Xerox's most successful effort in IS is supplying printers for mainframe installation and corporate publishing environments, with its 9700 printer line serving as the mainstay. In 1989, the company introduced the Xerox 4650, a $150,000 printer that prints 50 pages per minute with a resolution of 600 dots per inch. And on the low end, it unveiled the 4030, a $3,000 desktop printer. "Through our printers, publishing systems and smart copiers, we can be partners with a lot of other people," Lowe says.

Most of Xerox's partnerships in 1989 were in systems integration. It snared a $4 million contract to lead one of four teams submitting design proposals for the Army's Computer-Aided Acquisition and Logistics Support (CALS) System—a massive effort to set standards governing the way the Army manages and communicates complex documents to contractors and other government agencies. CALS will ultimately be installed at 56 Army sites and will cost some $500 million.

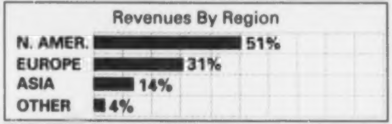
On the legal front, Xerox met defeat in its attempt to get credit for developing the graphical user interface that Apple Computer Inc. uses on its Macintosh desktop system. Although Apple concedes it made use of Xerox's design, in March a federal judge threw out most of Xerox's copyright suit. Xerox is appealing the decision.

—Joe Kelly

IS Revenues: $2.70 Billion

REGION		WORLD
10	WANG	21

Revenues By Region

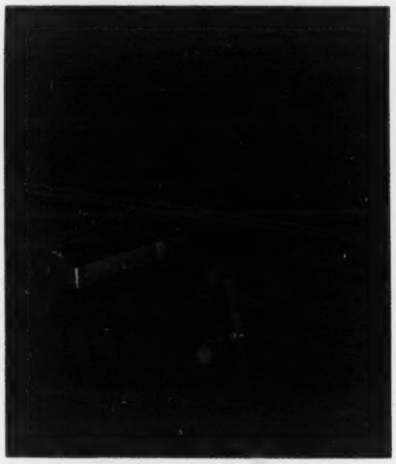


WANG LABORATORIES INC.
1 Industrial Avenue
Lowell, MA 01851
(508)-459-5000

Change is the order of the day for Wang Laboratories Inc. The company is developing standards-based computer systems to complement its proprietary line of products. It's adjusting to a new management team that emphasizes efficiency over legacy. And it's betting big on imaging to improve its sagging fortunes.

Wang's new emphasis on standards is a major shift. Prior to the company's formal announcement of an open systems strategy last December, Wang had clung to its proprietary VS computer family even as many of its competitors bolted to UNIX, the AT&T operating system that's practically become synonymous with open or standards-based systems. That persistence led Wang to an 8% drop in sales in calendar 1989 to $2.7 billion and a $500 million loss, as customers held off buying proprietary systems from second-tier suppliers that had no formal open systems direction.

Things only got worse for Wang in 1989, a year that saw the company foun-



Wang's future is in the capable hands of Richard Miller.

der's son resign as president and chief operating officer. To start with, stiff price competition and a shift to the networked PCs and workstations cut Wang's margins in 1989. Additionally, service and rental income declined for the first time in 1989. Finally, foreign markets, the sole source of growth in product sales over the past three years, were hit hard by a strengthening dollar last year.

By the time Wang's fiscal year had ended in June 1989, the company had racked up $424 million in losses on $2.9 billion in revenues. Wang's credit rating dropped so low that it couldn't float short-term loans needed to meet operating expenses. After defaulting on some of its long-term loans, Wang finally reached new credit agreements with lenders—but only by pledging all assets, except inventory, as collateral. In the midst of this turmoil, Frederick A. Wang resigned as president and COO. His father and founder of the company, An Wang, remained as chairman and chief executive officer until his death a few months ago.

The man in charge of Wang these days is Richard W. Miller. After taking over for Fred Wang at the end of August, Miller spent two months reviewing the company and talking to customers. He next announced a reorganization plan for Wang intended to flatten the organization, speed delivery of products, minimize hassles for customers in dealing with Wang and rid the company of unnecessary assets and perks. He assumed the elder Wang's job responsibilities in March 1990.

Miller's track record may make him suited for the job. When RCA Corp. was acquired by General Electric Co. in 1986, he was called in to head up its consumer electronics division. There he presided over a restructuring that is credited with turning the company around.

Miller already seems to be making progress at Wang. He's chopped the work force by nearly a quarter to 22,500 employees. He's reduced operating costs by $300 million a year. He's sold off enough assets to trim $300 million off the $575 million Wang owes creditors. By selling additional assets, Wang hopes to pay off the entire debt this year.

By the end of the calendar 1989, Wang's financial condition looked in much better shape. Losses for the second half of the year totaled only $72.6 million—a noticeable improvement from the first half, when the company's bottom line dipped deeper than $400 million into the red. Sales still were suffering, however. Wang's calendar 1989 IS revenues were $2.7 billion—down from $2.9 billion the year before.

Despite problems elsewhere, 1989 sales of the Wang Integrated Image Systems (WIIS) grew by 25%. Four image-intensive markets—financial services, government, manufacturing, and legal and professional services—account for 75% of Wang's customer base.

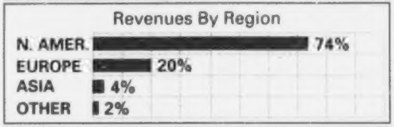
Wang has entered agreements with several software companies to integrate industry-standard products with its imaging technology. It has cut deals with Oracle Corp. for its relational database software; Gupta Technologies Inc. for its PC application development tools; and Novell Inc. for jointly developing an image server for NetWare users.

Wang is banking on image technology to open doors into the open systems realm for the company, with plans to develop future image applications on UNIX platforms. Wang admittedly is late to the open systems market, only announcing a strategy for entering it seven months ago. OPEN/Architecture, as Wang calls its UNIX-based suite of products and services, follows an industry trend toward a client/server model for distributed, heterogeneous environments based on standards.

—Chris Sivula

IS Revenues: $2.48 Billion

REGION		WORLD
11	EDS	23



ELECTRONIC DATA SYSTEMS CORP.

7171 Forest Lane
Dallas, Texas 75230
(214)-661-6000

Now that most of its key systems manufacturing partners have decided to become its competitors too, Electronic Data Systems Corp. must look to new strategies and tactics in order to sustain the kind of growth its shareholders have come to expect.

Although 1989 saw IBM, Digital Equipment Corp. and most of the Big Eight accounting firms getting into the systems integration and facilities management business that EDS pioneered 28 years ago, the General Motors Corp. subsidiary still managed to post record sales and earnings. EDS reported revenues of $2.46 billion from non-GM sources, up 23.5% compared with 1988's showing. EDS' total revenues, including business with GM, was $5.47 billion, up 13%. The company's revenues from non-GM sources rose from 41% of total revenues in 1988 to 45% in 1989. EDS' earnings increased 13% to $435.3 million.

"People ask me from time to time, 'How long can you keep it up?' " says EDS senior vice president Gary Fernandes. "The answer is: I don't know. I hope for a long time in the future."

To make sure that happens, EDS is trying to boost its image both domestically and internationally; to expand its presence in key manufacturing, transportation and energy markets; and to lower the price it pays for raw materials—i.e, information technology.

Early in 1989, to lower its raw materials costs, EDS finalized an agreement to acquire a minority interest in Hitachi Data Systems Corp., formerly the National Advanced Systems Corp. plug-compatible manufacturer subsidiary of National Semiconductor Corp. EDS became a partner in HDS, says Fernandes, because increasingly its competitors in the systems integration business are hardware manufacturers. "Traditionally, we thought we could get our [hardware] costs down through volume, but that's not true when you're competing with manufacturers," he says.

EDS made another major financial move later in the year when it bought a stake in System One—Texas Air Corp.'s computer reservation system. In exchange for its investment, EDS got a 50% equity interest in the reservation system plus a facilities management contract valued at as much as $4 billion. And EDS overnight gained a major position in a key transportation market.

EDS also made moves into other significant, relatively untapped markets for the company. In manufacturing, EDS beat out IBM for a 10-year contract to manage and operate data centers and voice and data communications for Cummins Engine Co. Inc. of Columbus, Ind. And in the energy market last year, EDS followed a 10-year management agreement with New Orleans-based Freeport-McMoRan Inc., as well as a similar deal with Enron Corp. in Houston. "We're pleased with the continued penetration in these areas," says Fernandes.

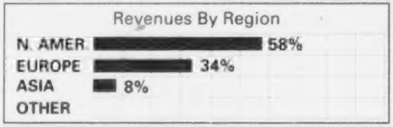
EDS also is making organizational changes designed to improve its position as a global service provider and drive decision making closer to its customers. The company, which currently derives only about 15% of its revenue from outside the United States, reworked its international reporting structure, giving managers outside the country more functional support and the freedom to make more decisions.

The entry of competitors such as IBM into the systems integration and facilities management business has forced EDS to face some new challenges. But, says Fernandes, it has also brought new attention to EDS' business. "It has created a lively public debate about such issues as outsourcing and an awareness that we could never have done on our own."

—Jeff Moad

IS Revenues: $2.10 Billion

REGION		WORLD
12	AMDAHL	26



AMDAHL CORP.
1250 East Arques Avenue
Sunnyvale, CA 94088
(408)-746-6000

Among systems suppliers, Amdahl Corp. has stood out as a success in recent years—despite occupying a market many dismiss as bygone: mainframe computers. Sales at the company, whose large scale systems are compatible with those made by IBM, have more than doubled since 1986.

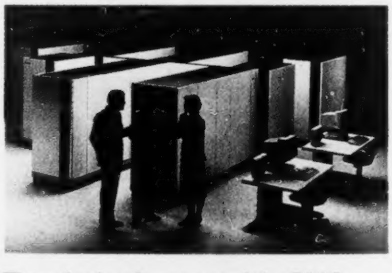
What kept Amdahl's star shining in 1989 was its ability to keep pace technologically with competitive moves and customer needs. The company's 5990 mainframes, new storage systems and rapid implementation of IBM's Enterprise Systems Architecture (ESA)—an enhanced version of Big Blue's chief large scale operating system—sent Amdahl into the $2 billion revenue galaxy last year.

Keeping up or ahead of IBM—Amdahl's chief rival—has its rewards and its price. In 1989, the price/performance features of Amdahl's products were so alluring that nearly one out of every four systems Amdahl shipped went to new customers, raising company sales nearly 17% to $2.1 billion. IBM reacted by discounting its systems, which forced Amdahl to cut profits. Earnings at the company fell 30% to $153 billion last year.

Although discounting may ease in 1990, earnings still will be under pressure from the high prices Amdahl pays in U.S. dollars to buy computers and components from Fujitsu Ltd. The Japanese company not only owns part of Amdahl, it supplies the U.S. concern with much of the technology that goes into the 5990s (which now account for the majority of Amdahl's sales) and two other new products: the 6100 storage subsystems and the new 7300 UNIX computers. Purchases of computers and subsystems from the Japanese company totaled $767 million in 1989.

Two other factors that hurt earnings at Amdahl in 1989 actually signify good things for its customers. The company increased R&D spending by 25% to $277 million. And it set aside well over $100 million in engineering charges to convert existing Amdahl customers to ESA. "I'm counting on ESA being available and not just on the machines that are running at Sunnyvale," says Clark Johnson, director of information services for the city of Indianapolis, an Amdahl shop. Johnson intends to upgrade the city's Amdahl machines to ESA in 1991 or 1992. All new 5990s and 5880s ship with ESA.

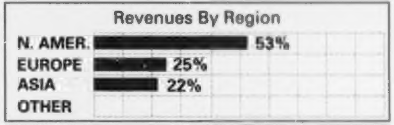
Amdahl is making progress elsewhere—technologically and geographically. In early 1989, the company released an updated version of UTS, its version of AT&T's UNIX System 5 operating system. Most of Amdahl's UNIX sales are on systems that are also running MVS, IBM's chief large scale operating system. Amdahl's first computers dedicated exclusively to the UNIX marketplace are its 7300s, which are reprogrammed versions of Fujitsu M 760-class mini-mainframes. The company also paid $30 million to buy Key Computer Laboratories Inc., a Silicon Valley start-up developing high-performance UNIX-based machines.


The price/performance of the 5990 helped raise Amdahl's sales nearly 17%.

Two big orders from the Australian government boosted Amdahl's Asia/Pacific revenues to more than 8% of sales in 1989. In Europe, which accounts for more than a third of the company's sales, Amdahl appointed Peter V. Williams, who was general manager of European sales, to a new post as office of the chairman-Europe. *—Joe Kelley*

IS Revenues: $2.06 Billion

REGION		WORLD
13	SUN MICROSYSTEMS	27



SUN MICROSYSTEMS INC.
2550 Garcia Avenue
Moutain View, CA 94043
(415)-960-1300

In 1989, Sun Microsystems Inc. displayed a characteristic that could make the workstation maker a far more powerful force in the 1990s than some might have predicted a year ago. No, it wasn't that Sun hit $2 billion in information systems sales in 1989, although such a revenue record for an eight-year-old company is impressive. And no, it wasn't that Sun set a new price/performance standard in client-server computing with its SPARC family of computers, although 12.5 million instructions per second of computing power priced at $8,995 was mind-boggling for a time.

What distinguished Sun was its ability to manage through adversity—a quality that may again be tested as competition heats up in the company's chief line of business, UNIX workstations.

The real mettle of CEO Scott McNealy & Co. was tested last summer. What was supposed to have been a glorious conclusion to Sun's 1989 fiscal year, which ended June 30 of that year, turned out to be a disastrous quarter in which it lost $20.3 million. Everything seemed to conspire against Sun in its attempts to undertake the most important product transition in the company's short life to its own scalable processor architecture. Components were in short supply. Two top ex-

Scott McNealy with Sun's star performer, the SPARC workstation.

ecutives resigned. And Sun's internal information system management just didn't work up to par.

Suddenly, Wall Street analysts began to note just how much cash Sun's heady growth was burning up—as much as $30 million a month at one point, by McNealy's own reckoning. Overnight, the price/performance leader in distributed computing became just another troubled high-technology company.

"We hiccuped in 1989, but we're well beyond that now," says Ed Zander, vice president of corporate marketing for Sun, of the company's difficulties. Just how far beyond is remarkable, although the company remains cash strapped. Sun rebounded to profitability in the very next quarter. For all of calendar 1989, Sun earned $36.1 million on $2.1 billion in IS sales—down 60% in net income but up 40% in revenue from the previous year.

Virtually all of Sun's sales growth in 1989 came from a new line of workstations and servers introduced in April 1989 and based on its SPARC architecture. Systems based on the reduced instruction set computer (RISC) implementation now represent 80% of Sun's current sales—giving the company far greater control of its technical destiny than it had in the days when it relied on Motorola Inc. to supply 80% of the horsepower for its systems. Such control may well be needed by Sun in the days ahead as it battles against Digital Equipment Corp., Hewlett-Packard Co. and IBM.

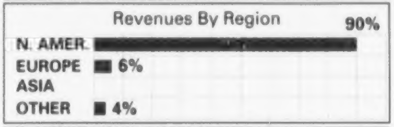
"Competitive announcements of workstations just reinforce our strategies," Zander says of new competitive offerings such as IBM's RS/6000 family of workstations and servers. "They create a much larger market for us to sell into."

But why should IS executives buy UNIX workstations from Sun when they can shop at $63 billion IBM or $13 billion Digital or $12 billion HP? Zander offers three reasons. One, Sun has scale. It's a $2 billion company with 12,000 employees, dwarfing the size of Digital's or HP's workstation operations. Two, Sun has software. More than 2,000 applications have been written for the SPARC platform, alone. Three, Sun singularly focuses on distributed, client-server computing.

Sun also has some limitations. Despite its effort to better manage costs, the company is still using more cash than it generates. The company had to secure at least $240 million in new debt financing to see it through fiscal 1990. Despite its effort to expand beyond technical computer sales, Sun still derives most of its revenues from software-engineering and design automation applications. Despite its orientation toward standards-based computing, Sun still must spend heavily on research and development—13% of revenues a year—to keep ahead of the competition. *—Tim Mead*

IS Revenues: $1.89 Billion

REGION		WORLD
14	TANDY	31



TANDY CORP.
1800 One Tandy Center
Fort Worth, TX 76102
(817)-390-3700

After the many new strategies, partnerships and research projects that Tandy Corp. initiated in 1988, it is only natural that 1989 should appear rather calm in comparison. Corporate revenues for the diversified electronics company last year grew only 7% to $4.3 billion, with nearly 45% of Tandy's sales coming from desktop systems and peripherals.

The company's earnings declined to $304 million in 1989, a 6% drop from the $323 million net income in 1988. The performance reflects, in part, declining profit margins in the personal computer business. The settlement of a patent dispute and cutthroat competition in consumer electronics, Tandy's main business, also hurt the bottom line.

However, this year's profits may benefit from marketing and technology initiatives that Tandy has taken in the past two years to reposition itself in the PC business. In 1988, the company purchased Fremont, Calif.-based Grid Systems Corp., a laptop and portable PC manufacturer that now is making impressive large-account sales. One sale in 1989 was a 400-unit order to supply laptop systems to American Airlines Inc.

An alliance with Digital Equipment Corp. to resell Tandy PCs under the Digital name provides Tandy with an additional channel for reaching *Fortune* 1,000 customers. And Tandy's DeskMate, a Windows-like graphical user interface for entry-level PCs, received the endorsement of Lotus Development Corp., which ported its popular 1-2-3 spreadsheet program to run on DeskMate-equipped systems.

Tandy's purchase of Grid Systems, and the subsequent reshuffling of responsibility of large corporate accounts to Grid, will have the most impact on the *Fortune* 1,000 market. The Tandy-Grid merger has produced a dependable supplier of high-quality computers in the eyes of James Montequnin, manager of communications for Union Pacific Railroad in Omaha. Originally chosen as a second source for PCs (after IBM), Tandy—via Grid—has emerged as Union Pacific's chief laptop supplier. "I probably wouldn't have looked at Grid for my laptops without them being associated with Tandy. But with Tandy behind them, you know they're going to be around, and you know they'll be offering price-competitive products," Montequnin says.

One reason Tandy can compete on price is its manufacturing prowess. The company is regarded as having perhaps the lowest production costs of any U.S. PC manufacturer. Tandy's $11 million Fort Worth plant, which opened in April of 1989, is capable of producing 5,000 computers a day and has labor costs amounting to less than 2% of the cost of each computer.

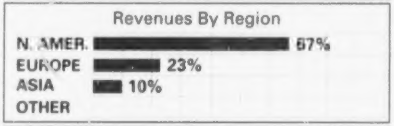
However, Tandy needs to improve in the marketing area. After years of trying, Tandy still has not really cracked the *Fortune* 1,000 market. The company's share of such business is so low that it gets lumped with "other" in market analyses. Large accounts offer significant growth opportunity for Tandy, which must tap into that potential to remain competitive with Apple Computer Inc., Compaq Computer Corp. and other PC makers effectively serving the biggest U.S. companies. To Tandy's credit, it can compete for large accounts when it chooses to—as it did in winning part of a 50,000-unit PC order from American Airlines (separate from the Grid contract).

Sales of systems at the low end of the U.S. PC market, which Tandy reaches via its Radio Shack outlets, have slowed, leading the company to place more emphasis on high-end products and foreign sales. Tandy last year acquired Victor Electronics—a Swedish supplier of desktop, laptop and handheld computers to European business users. Victor complements the company's consumer PC marketing efforts in Europe, where Tandy sells systems through the electronics stores of Fort Worth-based InterTAN Inc.

Looking toward Japan, Tandy continues to maintain close ties to Matsushita Electric Industrial Co. Ltd., better known in the United States for its Panasonic, Quasar and Technics consumer products. Tandy makes PCs for Matsushita. *—Bob Francis*

IS Revenues: $1.80 Billion

REGION		WORLD
15	SEAGATE	34



SEAGATE TECHNOLOGY INC.

920 Disc Drive
Scotts Valley, CA 95066
(408)-438-6550

Alan Shugart, the burly 58-year-old founder and chief executive officer of Seagate Technology Inc., can't be called a timid person. After a disastrous 1988, when a market miscalculation lead to a $5.5 million calendar year loss by Seagate (caused by a whopping single-quarter loss of $52.8 million), you'd have expected the company to think about retrenching in 1989. Instead, it laid out $300 million in cash and notes and nearly 11 million of its own shares to buy Control Data Corp.'s Imprimis disk drive business.

After the acquisition was completed in October, Seagate added Imprimis' financial results to its own. It reported fourth-quarter revenues of $690 million, double those of the same period in the year before. It ended calendar year 1989 with a profit of $104.7 million on sales of $1.8 billion. The acquisition doubles Seagate's size to a $2.5 billion organization (if you count a full year's worth of Imprimis sales), with a hefty research budget of $130 million.

Buying Imprimis provides Seagate with access to new markets—technologically and geographically—and new sales channels. It gives the company an entry to the high end (1 to 2 gigabytes) of the disk drive market—one in which none of Seagate's existing products competes. (Seagate itself makes rigid disk drives for use in small computers.) The Imprimis addition breaks new ground in Europe, the Pacific Rim and the United States. All but one of the Imprimis manufacturing facilities are in locations where Seagate isn't present—in Minnesota, Nebraska, Oklahoma, Malaysia, Portugal, Singapore and West Germany. Imprimis had recently built a new plant in Singapore, where Seagate operates a manufacturing facility. Seagate had sold its products mainly through distributors; it can now join forces with an Imprimis domestic and international sales organization that has very strong original equipment manufacturer (OEM) relationships.

It is only now that Seagate is beginning to retrench, seeking to strip away fat from Imprimis' budgets, dismantle structures and seek efficiencies in common sources of supply. For example, the thin-film manufacturing activities of each company are being combined.

In Shugart's mind, the acquisition enhances the company's scope of products, extends its reach virtually worldwide. Early this year, Seagate launched an advertising campaign that emphasized its capability to deliver drives for "the lightest laptop to the mightiest mainframe."

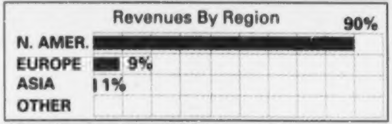
Shugart doesn't envisage any new storage technologies on the immediate horizon that could have an impact on magnetic medium. " 'I see lots of opportunities in large scale wafer integration in semiconductors when that technology is perfected. But it won't be in my lifetime."

Recently the U.S. Commerce Department said it would begin to allow the sale in Eastern Europe of disk storage devices with capacities up to 40 megabytes. Seagate, whose 17 overseas sales and support offices are in such strategic locations as Austria, Britain, France and West Germany, isn't hesitating. Seeing a "very large potential market," in Eastern Bloc nations, Shugart recently began running ads in Soviet computer trade papers. "We want to be there early," he says.

—Tom McCusker

IS Revenues: $1.69 Billion

REGION		WORLD
16	CONTROL DATA	35



CONTROL DATA CORP.

8100 34th Avenue South
Bloomington, MN 55425
(612)-853-8100

Mention "new strategic direction at Control Data Corp." to some people and you may have to run for cover. Years of strategic blunders and management misdirection have sown a legacy of cynicism and suspicion about this once venerable computer maker.

Dedicated customers like Walter McRae, interim director of university computing and networking services at the University of Georgia, have had their confidence in the company sorely tested. McRae was stunned by CDC's decision to drop the ETA Systems supercomputer and is now perplexed by recent announcements that seem to spell the death of the Cyber line of mainframes. "What will be the flagship product for CDC?" asks McRae. Others raise more fundamental issues. "The problem is not the product, it's management," maintains another veteran customer.

CDC believes it has addressed the management issue with the appointment of Lawrence Perlman as its new chief executive officer. Credited with turning around both the Commercial Credit Co. (sold in 1988) and CDC's storage products business (spun off as Imprimis Technology Inc. and sold last year to Seagate Technology for $450 million), Perlman takes the reins from Robert Price, who remains chairman. Perlman's stellar track record and his willingness to frankly address CDC's problems are the main reasons many analysts have put their CDC obituaries on hold.

Last year saw CDC undergo a reduction of almost unimaginable proportion. Besides jettisoning ETA and Imprimis, CDC sold off its Ticketron ticketing service, its credit-reporting services, its third-party maintenance business in Europe and the United States and also discontinued its VTC semiconductor operations. What's left—a handful of data services and the computer systems business—are expected to generate some $2 billion in revenue this year, down from $3.7 billion in total company revenues in 1985. And for the first time in years the company is awash in cash.

According to James Ousley, president of the Computer Products Division, the lower overhead and bolstered capital structure will allow CDC to survive on flat sales in 1990 while waiting for its new strategy in computers to kick in. CDC's strategy is to resell high-performance systems bought from others and enhanced with CDC systems know-how. It has inked deals with Convex Computer Corp., Cray Research Inc., MIPS Computer Systems Inc. and Silicon Graphics Computer Systems Inc.

In January 1990, the company announced the first products based on its MIPS alliance: the 4000 series of UNIX departmental computers based on reduced instruction set computing (RISC). The 4000 is a whole new price/performance category for CDC; at 55 million instructions per second, it's faster than the scalar versions of IBM's 3090-180J and faster even than CDC's own Cyber 2000, the new high end to the Cyber line, which CDC will begin shipping toward the end of this year. CDC equipped the 4000 with mainframe-like input/output (I/O) capability and is planning 10-megabyte-per-second linkups to existing Cyber systems.

By marrying the I/O and data storage capabilities of the mainframe with the price/performance power of RISC, CDC hopes to regain the ground it's been losing to Apollo Computer Inc., Digital Equipment Corp. and Sun Microsystems Inc.—and do it a lot less expensively than it could by building systems from scratch. The 4000 also signals the beginning of the end for the Cyber NOS/VE architecture. Company officials don't like to be pinned down, but by the late 1990s, they say, the Cyber will be history.

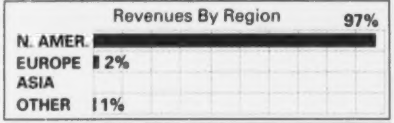
Ousley is convinced that just by recapturing business it has been losing within its existing customer base, CDC can boost annual computer sales 15% or more over the next two or three years. After the restructuring is accounted for, CDC lost $680.4 million on revenues of $2.9 billion in 1989.

Ousley expects no revenue growth in computers this year. The reason: sales of the 4000 will be offset by a drop in Cyber revenues while customers delay purchases, waiting for the new Cyber 2000. Meanwhile, CDC is investing heavily in what's left in the data services side of the business, which includes Arbitron Co.'s audience measurement products, lottery systems and an array of business management and information services.

Are CDC's loyal and beleaguered customers convinced CDC is on the right track this time? "A year ago, everyone was asking if we [were] getting out of the business," said Ousley in March. "Now customers are asking, 'What are you going to do for me next?' I take that as a good sign." —*Joe Kelly*

IS Revenues: $1.69 Billion

REGION		WORLD
17	ADP	36



AUTOMATIC DATA PROCESSING INC.

1 ADP Boulevard
Roseland, N.J. 07068
(201)-994-5000

Automatic Data Processing Inc. broke a record last year, but not one the 40-year-old company would care to boast about. ADP ended a 27-year streak of double-digit revenue and earnings increases by chalking up only a modest 8% growth rate in its fiscal year, which ended a year ago in June. Financially, the company fared even more poorly in the calendar year—inching up just over 4% on $1.7 billion in IS revenues.

Strategically, however, ADP looks to be in better shape these days. It has completely overhauled itself from top to bottom, concentrating now on four key businesses: Employer Services (ADP's traditional and largest business), Brokerage Services, Dealer Services (to automotive dealers) and Automotive Claims. The company divested four other businesses: its Real Estate processing business, which provided rent roll and accounting services; its automated teller machine (ATM) processing business, which concentrated primarily on medium-sized banks; Banking Information services, which served commercial banks and savings institutions; and a quotation services business in Canada.

"Our objective is to be No.1 in every business in which we compete," explains Arthur F. Weinbach, senior vice president of finance and administration for ADP. "We can also compete as a No.2, but with the objective to be No.1. In each of these larger, core businesses, we have the No.1 share, and we felt we could get the best returns in these areas."

The scope of services offered in each of the four key business areas has been broadened. Whereas ADP had once focused on discrete services, it now seeks to provide end-to-end services to any industry with which it does business. In Employer Services, for example, the change means providing an integrated package of services including human resources, benefits and financial services—not just payroll services.

Even as these changes were being introduced, ADP managed to achieve double-digit growth rates in both its Employer and Dealer lines of business. Employer Services grew about 15% in fiscal 1989. The on-site, PC-based part of this service grew to 40,000 installed units last year, compared with about 25,000 in 1988. In August, ADP introduced Easypay, an on-site service for companies with less than 50 employees; so far, 2,000 such systems have been installed. In addition, the company introduced a new, laser printed W-2 form, which includes information beyond basic salary and wage guidelines. Dealer Services, which provides information and on-site services to automotive dealers, also achieved double-digit growth rates in 1989, roughly equaling its 1988 growth.

In 1989, ADP broadened the scope of the services it offers.

The company's automotive business, which processed more than 5 million claims in fiscal 1989, grew only in single digits—less than its double-digit performance of the previous year. One reason for the slowdown was the lack of a handheld terminal, which a client could use to input claims. ADP remedied the problem in December 1989 by introducing such a device. Since then, the business has gone back to double-digit growth rates, Weinbach says.

Brokerage Services, still reeling from troubles on Wall Street, declined 10%, or $30 million in revenues, during ADP's fiscal period—the first time this business did not grow for ADP. Nevertheless, the company brought out three new products for this market in 1989—a new, PS/2-based front-office quotation service for two of its largest customers, Merrill Lynch & Co. and Shearson Lehman Hutton Inc.; Brokerage Plus, a mainframe-based back-office product that provides access to customer file information; and an upgrade of its Cage III transaction system. ADP says its brokerage business returned to profitability in the third quarter of calendar 1989.

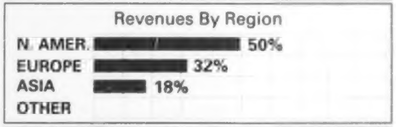
On the management side of the house, William Turner, ADP president and chief operating officer, resigned to join Forstmann Little, a venture capital company. Josh S. Weston, chairman and chief executive, picked up Turner's duties. Glenn Marschel, a 15-year ADP employee, was named president of Employer Services, and Gary Butler was named president of Dealer Services. Weinbach was elected a director of the company.

In acquisitions, a traditional method of growth for ADP, the company acquired Automatic Business Centers of Moorestown, N.J., which provides payroll services to about 11,000 companies primarily in the northeastern United States, for an undisclosed price.

—David Brousell

IS Revenues: $1.68 Billion

REGION		WORLD
18	TANDEM	37



TANDEM COMPUTERS INC.

19333 Vallco Parkway
Cupertino, CA 95014
(408)-725-6000

At a time when many computer companies are delaying product introductions because of soft market demand, Tandem keeps blitzing the industry. The company's tradition of concentrating on fault tolerant, on-line transaction-processing systems continues to pay off. Tandem's revenue for calendar 1989 was up nearly 18% to $1.7 billion; earnings also increased by 15% to $117.8 million, thereby bolstering the company's leadership position in fault tolerant computing.

Although cautious about general business conditions, Tandem expects similar growth this year. "New products will make the difference for success this year," says Bob Jolls, vice president of product marketing.

Among Tandem's more recent product introductions is the Cyclone, an on-line mainframe that packs IBM 3090 class performance into a price range of $2 million to $10 million; the Integrity S2, a UNIX system based on reduced instruction set computing (RISC) technology, priced between $172,000 and $248,000; and new storage and communications options for its entry-level CLX line.

Early reports indicate that the Cyclone is living up to customer expectations. "It has met all the benchmarks for our applications," notes Al Bocchetti, vice president of trading operations at the New York Stock Exchange, a beta test site and Tandem user for 11 years.

While the Cyclone represents maximum on-line power available today, Tandem realizes that tomorrow's markets may favor a more distributed environment. The company's UNIX-based Integrity S2s represent a move in that direction. In this effort, Tandem is relying increasingly on RISC technology. "This is very important to us," says Jolls. "The fundamental parallelism inherent in our systems lets us take full advantage of this technology." Other areas of increasing technological importance are fiber optics and larger database capability. The Cyclone already uses fiber optics to connect major components within the system.

Also new for the company is a major push to establish relationships with industry partners. Earlier this year, Tandem signed a major reseller agreement with Nixdorf Computer AG for the Integrity S2 and a large marketing agreement with AT&T. And in 1989, Tandem for the first time reached outside to key software suppliers for solutions that it could not supply itself. "You have to focus on doing very well the things you know best and let other specialists support you with their expertise," says Jolls.

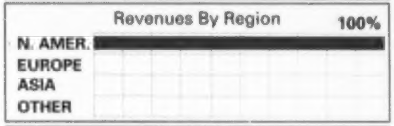
Among the agreements were several major database announcements. During 1989, Tandem signed a strategic agreement with Oracle Corp. to develop and market Oracle's database tools for use with Tandem's NonStop SQL database management software. Another agreement was signed with Sybase Inc. to license the right to develop an Ashton-Tate/Microsoft SQL Server interface to NonStop SQL.

Tandem's markets are geographically well balanced, with 50% of the company's sales being domestic, 32% coming from Europe and 18% from the Far East. This ratio has remained fairly constant for the past several years and is expected to continue.

—Kurt Rothschild

IS Revenues: $1.64 Billion

REGION		WORLD
19	TRW	38



TRW INC.

1900 Richmond Road
Cleveland, OH 44124
(216)-291-7000

TRW Inc. has gone the acquisition route to grow its information systems and services business. The conglomerate last year paid $330 million for Chilton Corp., the Dallas-based credit reporting agency.

Most of the Chilton organization was folded into TRW Credit Data Division—one of 10 entities that constitute TRW's Information Systems and Services (ISS) segment. The merger gave the segment a 31% boost in sales to $705 million and doubled its profits to $60 million. The segment now generates nearly 10% of TRW's $7.3 billion in corporate revenues—almost double its importance from a year ago.

The acquisition also gave the company information power. It now has a database covering virtually 100% of the estimated 160 million U.S. users of consumer credit. Through other operations within the information systems segment, TRW also began offering three other Chilton products, Employment Insight Report, an automated credit report that can be used for employment purposes; Social Search, a social security number search service for locating consumers; and Collection Aid, a package of services that can be used as precollection and collection tools.

A star performer in the ISS segment in 1989 was Berkeley, Calif.-based TRW Financial Systems Inc., which builds image-

Acquisitions and reorganization have boosted TRW's information power.

based information-processing systems. It signed multimillion-dollar orders with American Express Co., The Chase Manhattan Bank, MasterCard International Inc., New Jersey Bell and Pacific Bell Co. in 1989. It also signed a cross-licensing agreement with IBM under which TRW will develop distributed image-based applications to complement IBM's Image-Plus transaction system.

The company adopted a new strategy to rescue another unit of its ISS segment: TRW Customer Service Division, a 20-year-old third-party computer maintenance operation that had shrank 11% to $160 million in 1988. A growth spurt may be ahead; the division has started to provide maintenance services not only for selected products but for all computer products of multiple vendors in large user organizations. It also has maintenance agreements with high-volume microcomputer manufacturers. Marketing manager Steve Marcus characterizes 1989 as a transition year in which revenues remained flat. He forecasts a significant turnaround for the division in 1990.

The ISS segment contributed less than half of TRW's total 1989 IS revenues of $2.1 billion, up 7.6% over 1988 revenues. The $2.1 billion includes revenue from the recently formed Systems Integration Group, which combines divisions from TRW's Federal Systems Group in Fairfax, Va., and the Defense Systems Group in Redondo Beach, Calif. For the Defense Department and other government agencies, these groups provide software and systems engineering to help develop and manage hundreds of command and control centers, as well as large database management systems.

Although much of TRW's IS-related work is defense related, the company in recent years has been placing heavy emphasis on commercial applications. It operates a technology service organization, a unit aimed at commercializing TRW scientific and engineering developments.

TRW is a major player in IS, despite its relatively subdued public image in the field. In fact, it is the second largest U.S. employer, behind IBM, of system software engineers. It has about 10,000 such engineers, says Bill Nelson, director of technical management. TRW would be considered even bigger than Electronic Data Systems Corp. in professional IS services if it could count all of the work done on classified defense projects in that category. A case in point is its ESL Inc. unit, a hush-hush member of TRW's Avionics and Surveillance segment. ESL became a value-added reseller for Next Inc., selling the Steve Jobs' wonder machine to government agencies and their contractors. *—Tom McCusker*

IS Revenues: $1.52 Billion

REGION		WORLD
20	PRIME	39

Revenues By Region

N. AMER.	41%
EUROPE	30%
ASIA	29%
OTHER	

PRIME COMPUTER INC.

Prime Park Way
Natick, MA 01760
(508)-655-8000

It was a tumultuous year for Prime Computer Inc., including a hostile takeover bid from Tustin, Calif.-based MAI Basic Four Inc. and the eventual emergence of a white knight in the form of New York venture capital giant J.H. Whitney & Co.

In August, J.H. Whitney acquired 79% of Prime's common stock, about 49.5 million shares, at $20 apiece. The move effectively cut off MAI at the pass. J.H. Whitney picked up the remaining shares in January to complete its acquisition.

The change in ownership didn't come without pain. In August, James F. McDonald, former head of Gould Inc., replaced Anthony L. Craig, Prime's president and chief executive officer since Joe Henson's resignation the previous October. McDonald announced a restructuring plan that included the layoff of about 2,500 people, or 20% of the work force. The job cuts came on top of 1,200 layoffs that had been announced in the first part of the year.

Prime had modest performance gains after the acquisition. Product revenue in the quarter before the acquisition was $206.7 million and $232.5 million the following quarter. All revenues for the year were down slightly, from $1.59 billion in 1988 to $1.52 billion in 1989.

With two different restructuring plans, three different presidents, (former Digital Equipment Corp. vice president Jack Shields was brought in to replace McDonald), lawsuits and financial maneuvering, it's not surprising that new products took a back seat in 1989. Still, Prime did offer some enhancements to its engineering products, including new computer-aided design (CAD) software products and new CAD workstations based on Sun Microsystems Inc.'s SPARC microprocessor technology.

The company's single addition to its flagship line in 1989—a new low-end minicomputer system for the 50 series—appeared to some as a rather weak enhancement, fueling speculation about Prime's future as a minicomputer maker.

To silence such talk, Richard Snyder, vice president of the Computer Systems Business Unit, met with users in Dallas in November and promised a more vigorous development course, including multiprocessor-based systems that will nearly double the 50's maximum performance to 56 million instructions per second. This January, part of Snyder's promises were met when a new single-processor high-end system was introduced.

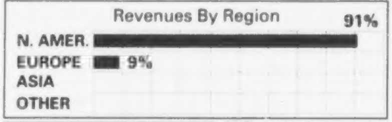
Despite such continued assurances from the company, concerns about support for its traditional minicomputer line date back at least to 1988, when it acquired Computervision Corp. That purchase made Prime the second biggest computer-aided design/manufacturing (CAD/CAM) vendor in the world, behind IBM.

Following the Computervision deal, the CAD/CAM business accounted for 19% of Prime's revenues. Last year, following a restructuring that broke the company into five independent units, Prime's CAD/CAM business grew to 32% of total revenues. In the international arena, where Prime gets 60% of all its revenues, CAD/CAM was even more important, accounting for 42% of revenue.

The existing base of 50 series customers represents too much potential revenue to abandon entirely. Still, the line on Prime for the last few years is that it's using CAD/CAM as a wedge to drive itself into a smaller, but profitable, niche. Nothing in last year's turmoil appears to invalidate that view. *—Chris Sivula*

IS Revenues: $1.44 Billion

REGION **21** — **CSC** — WORLD **41**



COMPUTER SCIENCES CORP.

2100 East Grand Avenue
El Segundo, CA 90245
(213)-615-0311

Computer Sciences Corp., one of the industry's vintage vendors, celebrated its 30th anniversary last year. But the $1.4 billion giant hardly rested on its three decades of laurels in serving the information systems industry. CSC, which grew 15% last year, instead set an ambitious course to widen its already mammoth systems integration business—widely embracing commercial users.

Government users—specifically Uncle Sam—now give CSC most of its systems integration clout. Roughly two-thirds of the company's revenues stem from government business. But as U.S. defense spending slows, so too must revenue opportunities for integrators feeding at the federal trough. Foreseeing a slowdown in government integration projects, CSC's chairman and president William Hoover reorganized the company in 1989—redirecting its focus onto the commercial horizon and shedding nonstrategic assets.

CSC's stated goal is to derive 50% of its operating profits from the commercial sector by 1994. By then, the company hopes to rank among the top two or three systems integrators in the United States and Europe. Electronic Data Systems Corp., Andersen Consulting and the integrator's arms of major systems suppliers such as IBM now best CSC in the United States in the commercial systems integration market, whereas Cap Gemini Sogeti and others have the lead in Europe.

With the commercial objective in mind, CSC launched a series of aggressive moves in 1989. Revamping its internal structure, CSC combined its Computer Partners Inc., Index Group Inc., Communications Industry Services and CSC Europe operations to form CSC Consulting, which is headed by former Index chairman Thomas Gerrity. The expanded group attracted some prime talent from Andersen during the year. One of the brightest stars in that talent galaxy was Mel Bergstein, who shot over to the CSC camp last summer after spending 21 years at Andersen as the respected leader of its worldwide information technology practice.

Bergstein's defection had to be a blow to Andersen, which was also taking its knocks from CSC in the marketplace. "We're consistently winning against Andersen," Gerrity boasts, attributing these wins to the company's all-encompassing turnkey approach. "We're not interested in just producing a black box. We're interested in making sure that whatever the box is, it fits well with the customer's business."

CSC also has decided apparently that the U.S. subsidiaries of some foreign rivals fit well with its own business. It announced a marketing alliance with SAP America Inc., the U.S. arm of SAP AG in Walldorf, West Germany, an application software vendor. Under the pact, CSC will jointly sell SAP's R/2 software, which is aimed at the manufacturing and distribution industries. It also is negotiating to buy Cleveland Consulting Associates Inc., a logistics and operations management consulting firm owned by England's Saatchi & Saatchi PLC.

CSC also has been active on the European front. In the spring of 1989, it acquired CIG-Intersys Group, the largest computer services company in Belgium. Five months later, in November, CSC bought British consulting firm Inforem Ltd.

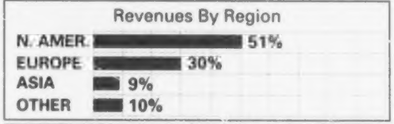
There's a method to these mergers and moves by CSC, which is clearly signaling its strong intent to beef up its systems integration and IT consulting efforts in various vertical industry segments. "We aim to keep building our industry and application strength," confirms Gerrity, who adds that this strategy will keep CSC on the takeover trail. "We'll continue to look for attractive consulting or systems integration acquisitions in the U.S. and Europe—acquisitions that can provide us with either industry or technical expertise or with geographic coverage that complements our own."

Restructuring put Thomas Gerrity in charge of CSC Consulting.

One thing that doesn't complement CSC's new business thrust is its Infonet operation. Early last year, it reported selling off the final vestiges of its historic telecommunications service. Industry watchers opine that with this symbolic shedding, CSC is preparing to play a much more powerful role on the worldwide systems integration stage. *—Linda Runyan*

IS Revenues: $1.30 Billion

REGION **22** — **DATA GENERAL** — WORLD **43**



DATA GENERAL CORP.

4400 Computer Drive
Westborough, MA. 01580
(508)-366-8911

There was a nice present under the tree for Data General Corp. last Christmas. A few days before the holiday, the U.S. Department of the Interior awarded Data General a $127 million contract for 6,000 Aviion workstations, a line of UNIX-based systems on which the company hopes to build its future.

DG officials are hoping the contract represents a turning point. The company hasn't had a profitable year since 1986, losing $121 million on $1.3 billion in sales in calendar 1989. After five years of cutting employees, selling facilities, reducing inventory and shrinking long-term debt at the company, management is telling customers and stockholders that the cycle of losses may be ending soon.

If DG's honchos are correct, then 1989 will be considered as pivotal a year for the firm as 1969, when it first delivered its Nova minicomputer. Not only did DG change into an open systems supplier in 1989, it also changed its leadership. Ed-son D. de Castro, cofounder and president of DG since the company's inception in 1968, removed himself from day-to-day operations—assuming the role of chief scientist and the title of chairman of the board. He handed over the operational reins to Ronald L. Skates, now president and chief executive officer.

De Castro, Skates and company are trying to blot up DG's red ink in two ways—structurally and technologically. Work force reductions, personnel reallocations and plant closings have changed the look of the company; an emphasis on standards-based products has altered its product complexion.

The company let 2,000 workers go in October and has hinted at more cuts to come. Employment, in fact, has dropped steadily at DG since 1985, when it had 16,500 workers. Today's payroll numbers 12,000. The team also chipped away at bricks and mortar last year, consolidating all U.S. manufacturing at its Apex, N.C., plant. It sold facilities in Hooksett, N.H.; Sunnyvale and Manhattan Beach, Calif.; and Singapore. And the company plans to close plants and offices in Westbrook, Maine; Portsmouth and Durham, N.H.; and Clayton, N.C.

During the second half of the 1980s, DG trimmed about $300 million from annual expenses and incurred restructuring costs of about $200 million. What resources remain are being spent on critical functions. The sales and systems engineering work force increased 13% over the past two calendar years. R&D spending over the same period increased 8% to $172 million. Yet, even with these investments, DG figures it may break even in FY1990 (ending Sept. 30, 1990) if its revenues equal those of FY1989. Skates is predicting a profit in FY1991.

DG's revenues in the future will come from two sources—its installed base of customers and new prospects. The company has installed 35,000 MV systems since the proprietary minicomputer system was introduced in 1980. And it has continually upgraded their performance; two new high-end machines, the MV/40000 and MV/40000 HA, debuted in 1989 alone. Although the company promises continued support for the MV line, it acknowledges that sales of the machines are sluggish and will remain so.

Servicing and maintaining DG's old products still generates more than $400 million in revenue a year—an important source of cash as the company makes the transition to open systems products. DG began delivering one such line of products, the Aviion workstations, in early 1989. The systems use Motorola Inc.'s 88000 reduced instruction set computing (RISC) technology and an operating system based on UNIX known as DG/UX. DG also is working on a superminicomputer-class implementation of Motorola's technology.

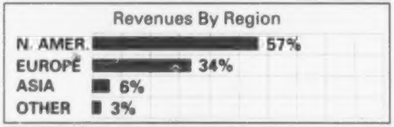
DG/UX is purposely designed for commercial applications—the focus of DG's efforts in the competitive world of open systems. The company has pretty much ceded technical and scientific applications—DG's strong suits a decade or so ago—to Sun Microsystems Inc. and others. Staying within the commercial focus, DG has devoted much of its resources to getting the makers of commercial applications to port their software to the Aviion line. Company officials readily admit that a lack of available software hampered the MV series and that they want to avoid a similar mistake in the future.

The new DG team hopes it has enough of a head start over its chief commercial UNIX rivals, IBM and Digital Equipment Corp., to become profitable again. Officials are now waiting to see if their move to open systems will prove successful. IBM's AIX UNIX-based operating system, running on its RISC System/6000 systems and other Big Blue platforms, and Digital's ULTRIX OS, running on the company's VAX and workstation systems, stand in the way of such success. Of course, IBM and Digital were there when de Castro's starting team formed the company in 1968. Time will tell his new team can beat the odds again. —*Chris Sivula*

IS Revenues: $1.29 Billion

REGION 23 **COMPUTER ASSOCIATES** WORLD 44

Revenues By Region



COMPUTER ASSOCIATES INTERNATIONAL INC.

711 Stewart Avenue
Garden City, NY 11530
(516)-227-3300

“I only pursued four of the 23 companies I bought,” reveals Charles Wang, chairman of Computer Associates International Inc., the largest independent software supplier in the United States. “The rest came to us when they were in the process of bellying up.”

The biggest to come cap in hand to Wang in 1989 was once mighty database king Cullinet Software Inc. Wang bought Cullinet last September for $300 million, adding the Westwood, Mass., company to his existing stable of database software thoroughbreds. He had corralled Applied Data Research (ADR) a year earlier.

Both Cullinet and ADR were victims of IBM's renewed determination to dominate the database management system (DBMS) business—a key force creating acquisition opportunities for Computer Associates. Wang expects many more independent software companies from all sectors to join his fold in the years ahead because of IBM's bundling of software with its proprietary hardware and IBM's investment in selected software companies.

The cost of being the chief alternative to IBM for large scale systems application software is mounting. Spending on research and development at Computer Associates consumed 13% of revenues in 1989. Product support and enhancement has become a huge burden, now encompassing more than 210 (initially incompatible) products. And now as Computer Associates matures, revenue growth is slowing. In the fourth quarter of 1989, revenues were actually 4% lower than they were in the same quarter of 1988.

For all of 1989, Computer Associates reported revenues of $1.3 billion (restated to reflect the acquisition of Cullinet), which represents an increase of 39.8% over 1988's figures. But earnings fell 6% to $133.2 million.

Wang is not worried about slowing growth, apparently convinced that the customers who came with the Cullinet and ADR acquisitions will soon resume buying products in earnest. He's offering these customers new versions of their databases, which will run existing applications, as well as databases built with structured query language (SQL), the standard for DBMSs in the 1990s. That's a far different solution than the one IBM offers its customers who want their existing applications to be able to take advantage of SQL. They must convert from IMS, IBM's older database software, to DB2, its newer version. And they must pay separate licensing fees if they run both IMS and DB2. Computer Associates puts its solution under a single license fee.

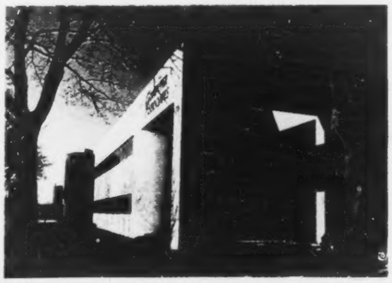
The ADR product is already available and customers expect the Cullinet version, known as IDMS 12.0, by midyear.

George Emmanuel, MIS Program manager at Hughes Aircraft Co.'s Training Support Systems Group in Los Angeles, says that he and other IDMS customers have been waiting five years for such a product. "I'm certain we [IDMS sites] will open our coffers in a big way," he predicts.

Wang also is confident that the multitude of new products introduced last year will sell well this year. The most important product, perhaps, is its Application Construction Environment (ACE), a pivotal software architecture that allows customers to develop database applications in Digital Equipment Corp., IBM and eventually UNIX environments. Other new offerings include seven new data center products and 20 enhancements to existing ones, relational extensions to CA's Masterpiece financial system and a new release of its SuperCalc5 spreadsheet software. Also unveiled was its important CA-DB:cBASE, an applications development system for relational DBMSs compatible with Ashton-Tate Corp.'s popular dBASE language.

Wang says that CA now offers ACE, CA-Datacom-DB (the company's premier relational database) and—unlike IBM—DB2 support for Ashton-Tate's program. He says there are 2 million authorized customers of dBASE and millions who aren't authorized. "Even my mother programs in dBASE," he quips.

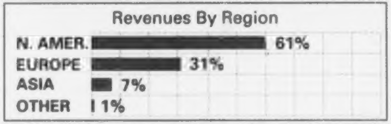
In the chairman's eyes, all available programmers must be put to work—especially those at the PC end—if the applications organizations need to compete in the 1990s are going to be built. "And we must be able to build on their work," he adds, echoing his principal theme of preserving investment in existing applications. "IBM isn't interested in doing this. There is planned obsolescence in everything it sells: a product is strategic only while it acts as a magnet for hardware sales." *—Ralph Carlyle*



CA expects to house more independent software companies under its roof.

IS Revenues: $1.22 Billion

REGION 24 — **ARTHUR ANDERSEN** — WORLD 45



Revenues By Region

N. AMER.	61%
EUROPE	31%
ASIA	7%
OTHER	1%

ANDERSEN CONSULTING

69 West Washington Street
Chicago, IL 60602
(312)-580-0069

"Can hardware suppliers deliver solutions? Can IBM and the other vendors really cast themselves as systems integrators?"

The man asking those questions is George Shaheen, who took over in 1988 as managing partner of Arthur Andersen & Co. S.C.'s consulting business, Andersen Consulting. Translated, Shaheen's questions really mean: "Can traditional vendors sell solutions instead of just pushing boxes? Are they really objective enough to be systems integrators?" Such inquiries would have been academic just a few years ago. But with software and services accounting for a larger and larger portion of every vendor's income, those questions now have the edge of a competitive taunt.

Not since Electronic Data Systems Corp. took off in the late 1960s has the service side of the information systems industry seen the kind of growth shown by Andersen Consulting. An independent business unit, Andersen Consulting has grown from less than $200 million in fees in 1980 to more than $1.4 billion for the fiscal year that ended August 31, 1989. This figure represents 43% of Arthur Andersen's total 1989 fiscal revenues of $3.4 billion. DATAMATION estimates that 85% of Andersen Consulting is IS related—putting the firm's 1989 IS revenues at $1.2 billion.

Andersen's tremendous growth—it far outstrips any of its rivals among the major accounting firms—is attributable to its willingness to go beyond traditional management consulting and strategic analysis and get its hands dirty with programming and facilities management. "Other firms are not as comfortable combining the different services under one roof," says David Lord of Consultants News, an industry analysis firm in Fitzwilliam, N.H.

The strategy apparently works well. Andersen has made its presence felt in a number of industries, from retailing (Sears, Roebuck and Co.) to heavy equipment (Caterpillar Inc.) to consumer electronics (N.V. Philips' GL).

Yet, Andersen carries particular clout in financial services. The big New York City investment banking firm, Salomon Brothers Inc., is using Andersen as the systems integrator and project manager on Fulcrum, the overhaul of its technology infrastructure. Andersen has also designed and implemented trading systems for the Swiss and German futures exchanges, as well as the Italian and French stock exchanges. In facilities management, a new business for Andersen, the company has won a contract with soap maker Dial Corp., a subsidiary of Phoenix-based Greyhound-Dial Corp.

The growth of the consulting business has generated considerable tension inside Arthur Andersen. Partners in the tax and audit units resented the tremendous growth of the consulting side, while the consultants felt they were being unfairly compensated. In 1989, Andersen separated the audit/tax and consulting businesses into two separate business units, each with its own managing partner and a new approach that ties compensation more closely to performance.

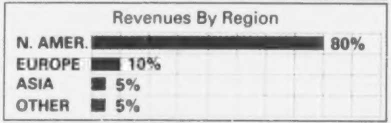
Even after the restructuring, Andersen Consulting continued to experience high-profile defections, which particularly plagued the company in 1988. Mel Bergstein, a former managing partner in charge of technology, joined rival Computer Sciences Corp. last year. The proposed merger with Price Waterhouse, a move that might have helped restore the auditing side's clout within the firm, also fell apart in September amid much talk of Price's "blue blood" culture clashing with Andersen's more "Marine-like" style. In addition, concerns were raised over the close relationship between Andersen Consulting and IBM, which is a Price Waterhouse audit client. The Securities and Exchange Commission bans joint ventures between CPA firms and audit clients.

Shaheen says that he wants Andersen to be as independent as possible, but he sees the necessity in forming close alliances between his firm and system vendors. "The marketplace is forcing everyone to declare," says Shaheen. "I can't have my firm laid victim to IBM's goals and objectives. If they see me as a competitor, they will make it harder for me to see their technology." *—Joe Kelly*

THE DATAMATION 100

IS Revenues: $1.15 Billion

REGION **25** **NORTHERN TELECOM** WORLD **47**



NORTHERN TELECOM LTD.
3 Robert Speck Parkway
Mississauga, Ontario, Canada L4Z 3C8
(416)-897-9000

In October of 1988, Northern Telecom Ltd. introduced its Meridian Data Networking System, the most significant data communications product in its history and one of the most ambitious. MDNS was designed to merge disparate computers and networks into a single, centrally managed system.

But MDNS was not to be. Facing lukewarm customer reception and tens of millions of dollars in additional development costs, Northern Telecom terminated the MDNS 10 months after its introduction, throwing its data communications strategy into disarray.

However, from its 1989 financial performance, no one would know Northern Telecom had experienced any kind of setback. Earnings in 1989 rose 18% over 1988's performance (not counting the 1988 fourth-quarter restructuring costs), while overall sales were up 13% to $6.1 billion.

Northern Telecom's major business is the central office switches it markets primarily to telephone companies. Sales of these big ticket items rose nearly 12% to $3.3 billion, boosted by some large international orders. In 1989, Northern Telecom announced its FiberWorld family of fiber optic transmission and switching products for the central office market.

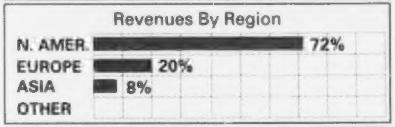
Sales of Northern Telecom private branch exchanges (PBXs), telephones, packet-switching systems and other data communications products rose 13.6% to $1.49 billion last year—the first real growth the company has seen in that side of its business since the early 1980s. Northern Telecom overhauled its PBX line in 1989, introducing Meridian 1, which integrates the company's SL-1 and SL-100 PBX systems into one modular architecture. The move, which parallels one made by AT&T with its Definity line, gives Northern Telecom customers a clear upgrade path. The software for the Meridian 1 can be configured to meet the standards of different countries, positioning Northern Telecom for growth in expanding international markets.

Northern Telecom holds just over 7% of the worldwide PBX market, which has been characterized by fierce price cutting, particularly in the United States. Consolidating its PBX line in the Meridian 1 will also enable Northern Telecom to control manufacturing costs.

The postmortems done on MDNS focus heavily on its proprietary architecture (it was based on another ill-fated Northern Telecom product, the old DV-1 minicomputer) and bad distribution. But Michael Doss, the company's vice president of marketing for data products, believes the MDNS was done in by the emergence of hybrid public-private networks. "Four years ago when MDNS was being designed, even corporate voice networks were private," says Doss, who is in charge of Northern Telecom's strategy in data communications. "Now they are hybrids. The same thing is going to happen in data. To succeed today you need to offer tools for building public and private networks." —*Joe Kelly*

IS Revenues: $982.5 Million

REGION **26** **STORAGETEK** WORLD **49**



STORAGE TECHNOLOGY CORP.
2270 South 88th Street
Louisville, CO 80028
(303)-673-5151

Storage Technology Corp. is making a habit out of proving the experts wrong.

Few such experts, whether from Wall Street or Silicon Valley, gave the maker of IBM mainframe-compatible storage devices much chance of coming back from its 1984 slide into Chapter 11 bankruptcy proceedings. But not only did StorageTek come back it has rebounded so well that this year it is likely to pass the $1 billion mark in annual sales.

The company nearly reached the milestone in 1989, achieving $982.5 million in sales. That was up 11% over 1988's revenue figure. The company's earnings picture appeared to improve even more noticeably last year, as net income soared 36.5% to $47.7 million. But most of its earnings growth came from an extraordinary gain of $11.3 million garnered from the liquidation of some overseas assets. Without the gain, StorageTek's net income only would have risen 4.3%.

Similarly, most observers gave StorageTek long odds on its plans to establish a new automated tape library system as a data center storage standard. Now, two years after introducing its 4400 Automated Cartridge System (ACS) to a chorus of skepticism, StorageTek has shipped over 1,250 of the tape libraries. The product last year accounted for about half the company's sales.

StorageTek expects to ship as many as 1,400 of the libraries in 1990, as a number of current customers begin to order multiple library subsystems. San Francisco-based utility Pacific Gas & Electric Co., for example, now has five libraries and is planning to add two more. PG&E says the system has paid off in improved batch performance, space savings and lower operator head count.

The ACS could account for up to 70% of StorageTek's business in 1990. "It's carrying the corporation in a very comfortable way right now," says StorageTek chairman and chief executive officer Ryal R. Poppa.

The success of the ACS is giving StorageTek room to execute what Poppa calls the final phase of the company's recovery process: rebuilding the product line. Poppa's rebuilding strategy has two key elements. He is targeting R&D spending—8.8% of revenues in 1990—selectively. Rather than attempt to match every new storage product from IBM or other competitors, StorageTek is focusing on key products for which the company can add value. And Poppa is broadening StorageTek's market beyond the company's traditional IBM-compatible base.

Poppa, for example, has decided to bypass the current generation of IBM large disk storage devices—the 3390. Instead, he's pouring R&D dollars into the next generation of such devices. In StorageTek's case, that is a disk storage subsystem code-named Iceberg. The undercover product is being designed as a family of storage subsystems incorporating a range of disk devices, each with different price/performance characteristics. It will ship by the end of next year.

Poppa has also been busy finding new markets for StorageTek products. Al-

StorageTek's 4400 ACS tape library is a surprise hit.

though 80% of the company's products are still sold into IBM and compatible mainframe shops, StorageTek has been creating interfaces to new environments for key products like the tape library. These new environments include information systems shops populated by Control Data Corp. systems, Sun Microsystems Inc. workstations and even Cray Research Inc. supercomputers. One StorageTek customer, Apple Computer Inc., uses an ACS to automate tape storage for a Cray that helps design personal computers.

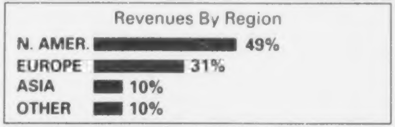
Poppa expects the non-IBM network-attached portion of StorageTek's business to grow fast, particularly with the advent of networks capable of transmitting information at 10 megabits per second and faster. In fact, StorageTek's non-IBM business is likely to grow to 50% of total revenues by the end of this decade, Poppa predicts.

"In the past, all our product planning was done by IBM," says Poppa. "Our strategy was when they announced, we announced. We got a box, we copied it. That isn't what we're doing today."

—Jeff Moad

IS Revenues: $952.8 Million

REGION
27
MICROSOFT
WORLD
50



MICROSOFT CORP.
1 Microsoft Way
Redmond, WA 98052
(206)-882-8080

Last year will be remembered as the year Microsoft Corp. and IBM finally acknowledged that widespread acceptance of OS/2 wasn't going to happen as fast as they thought.

But, while the slower than expected migration from MS-DOS to the new PC operating system may have hurt Microsoft's pride somewhat, it certainly didn't hurt the company's growth. Even without OS/2's success, chairman and chief executive officer William H. Gates' belief in the concept of the graphical user interface paid off handsomely through massive sales of Microsoft's Windows, the MS-DOS extension that became good enough for many a potential OS/2 convert. Last year, monthly sales of Windows swelled from 70,000 per month to 200,000.

Throughout the year, Microsoft strengthened its lead as a supplier of both systems and applications software for MS-DOS and Apple macintoshes and maintained its presence in the networking market. Microsoft's revenues climbed to nearly a third in calendar 1989 to $952.8 million from $718.6 million the previous year, while net income increased by 39% to $210.5 million.

For the first time, sales of application software as a percentage of total revenues soared past 50%, as systems software's revenue contribution slipped below 40%. That shift comes despite the fact that the company more than doubled its investment in research and development for systems software over the last 18 months. The increase in applications sales, Microsoft argues, is more a reflection of an industrywide slowdown in hardware sales than any change in emphasis by the folks up in Redmond.

Despite Microsoft's success with Windows, the company failed to deliver the new Windows 3.0 product by year's end, to the surprise of many analysts. This turn of events left other software companies that had Windows 3.0-compatible products waiting in the wings practically begging Microsoft to release the new version. At press time, it was targeted to be released in late May. Analysts agree that if Windows 3.0 lives up to its rumors as the closest thing yet to a Macintosh environment for the PC, Microsoft will ship millions of copies this year, along with another 14 million copies of MS-DOS.

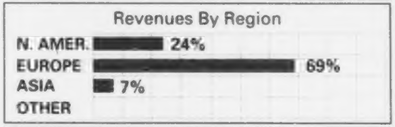
Publicly, Gates & Co. is backpedaling on question of how soon OS/2 and its accompanying Presentation Manager GUI will capture the corporate world, recommending that users look instead to Windows for their first GUI. Miffed software manufacturers that had invested heavily in OS/2 applications cried foul and belatedly set to work developing Windows versions of their products.

No one is saying for sure when, or even if, OS/2 will win widespread acceptance. But Microsoft can afford to be patient as it reaps in the income from Windows 3.0 and a suite of Windows applications of its own, including the Microsoft Word for Windows word-processing package announced in late 1989. "Real growth will be achieved [at Microsoft] because of this bet we made on the graphical user interface that other people didn't believe in," says Gates.

Next on Microsoft's plate is the matter of improving its networking offerings—LAN Manager and SQL Server—both of which fared disappointingly in 1989. With the recent speculation of a merger between Lotus Development Corp. and Novell Inc. into a new superpower, Microsoft finally had worries about a real competitor, especially in the networking arena. If nothing else, the merger alarm showed that at least two software companies are concerned about how big Microsoft's britches have become and how much influence Gates & Co. has on the rest of the industry. *—John McMullen*

IS Revenues: $866.5 Million

REGION
28
COMMODORE
WORLD
51



COMMODORE INTERNATIONAL LTD.
1200 Wilson Drive
West Chester, PA 19380
(215)-431-9100

The unfriendly reception Commodore International Ltd. has been getting for its Amiga personal computer showed up on the bottom line in 1989. Demand for Commodore's older, low-end 64 and 128 PCs headed south, and neither the Amiga nor Commodore's MS-DOS computers picked up the slack. Couple that with a strong dollar—80% of Commodore's sales are recorded in foreign currencies—and you have the reasons why Commodore's sales dropped about 10% to $866.5 million and net income plummeted to $8.3 million from $69.6 million.

Commodore has new management in place trying to get the company back on track. Replacing Max Toy as the new head of U.S. operations is Harold Copperman, who joined Commodore in the spring of 1989 from Apple Computer Inc. Copperman's goal is to reposition the high end of Commodore's Amiga line to compete with the Apple Macintosh.

To boost the Amiga's image, Commodore launched a $15 million television and print campaign featuring Buzz Aldrin, Burt Bachrach, the Pointer Sisters, Tip O'Neill and other celebrities playing up the Amiga's powerful graphics and unique functions, such as editing home movies.

Having worked previously in educational marketing at IBM, Copperman is now going after the education market, as well. He sees an opportunity in Apple's efforts to get schools to switch from the Apple II to the Macintosh.

Commodore has also beefed up its lackluster U.S. distribution efforts by signing deals with the Computer Factory Inc., Computerland Corp. and the Connecting Point.

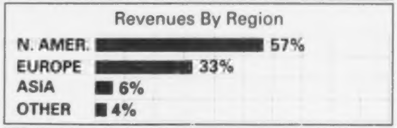
Commodore cut costs by closing its Taiwan production facility. It will now do the bulk of its manufacturing in Hong Kong, a move that is expected to save about $4 million a year. The company is also building a new automated warehouse in West Germany and is upgrading its semiconductor foundry in Pennsylvania.

As for other changes in management, Commodore has positioned new operating managers in Scandinavia, Switzerland and West Germany. These managers come with resumes that include stints at Compaq Computer Corp., NEC Corp. and Olivetti. Perhaps this new blood will give the company a boost in Europe, as it took a serious tumble in 1989 in Germany.

—Joe Kelly

IS Revenues: $860.1 Million

REGION		WORLD
29	**INTERGRAPH**	52



INTERGRAPH CORP.
Huntsville, AL 35894
(205)-730-2000

As the largest company in the world solely devoted to computer-aided design and manufacturing (CAD/CAM), Intergraph Corp. faces a slew of challenges. Growth in its core market is slowing, average system prices are falling and design packages written for PCs are stealing precious market share.

Intergraph, which built its reputation putting engineering and design software on VAX minicomputers, has successfully met each one of those challenges. But it has paid the price. Gross margins on Intergraph's system sales fell nearly 3% in calendar year 1989, and the company spent heavily on more sales representatives to hawk its new 6000 series of workstations and servers. Although Intergraph's overall sales rose 7.4% in 1989, earnings took a beating, falling nearly 10% to $79.5 million.

Intergraph was late on the workstation bandwagon but has come on strong in recent years. It now claims some 6% of the market with systems based on its own Clipper reduced instruction set computing (RISC) microprocessors. Intergraph's sales in the United States were basically flat in 1989, while international sales grew 17%. The transition to UNIX contributed to slow sales in 1989. "A lot of the growth we saw in the fourth quarter was business cultivated earlier in the year in anticipation of our products being ready in UNIX," says Maurice Romine, executive vice president of corporate marketing. The only Intergraph product not converted to UNIX is software for process plant design and analysis, Romine adds.

Intergraph has waged battles successfully at the low end against the likes of Autodesk Inc. Sales of Intergraph's MicroStation software for PCs rose 72% to $50 million in 1989.

Intergraph is looking to expand its role as a systems integrator. It is a subcontractor to Boeing Computer Services on the development of the Technical and Management Information System (TMIS) for NASA's Space Station Freedom. Intergraph executives are elated not only over the price—Romine says the announced $84 million budget is likely to get much bigger—but also over the opportunity to build a large distributed database system. In another systems integration effort, Intergraph has teamed up with Bethesda, Md.-based Martin Marietta Corp. to pursue the $500 million NAVSEA contract for the design and overhaul of the Navy's ship repair and support system.

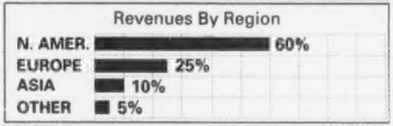
The move into systems integration is not just a defensive move to compensate for falling systems prices, says Romine. "It's not enough to just automate the architecture office," he says. "Integration across disciplines is where you really begin to see productivity improvements. Our customers are demanding it."

Eliott James, former president and chief executive officer of Quintus Computer Systems Inc. of Mountain View, Calif., a Prolog software house bought by Intergraph last year, was named Intergraph's president in October. Jim Meadlock, former president of Intergraph became CEO and chairman of the board.

—Joe Kelly

IS Revenues: $860 Million

REGION		WORLD
30	**MOTOROLA**	53



MOTOROLA INC.
Motorola Center
1303 East Algonquin Road
Schaumburg, IL 60196
(708)-397-5000

Motorola Inc. thinks the conditions are right to get serious about its computer business. Although it is a leading supplier of VME bus-based computer systems, its computer group has been losing money since 1985—to the tune of some $200 million in all. But Motorola now says it is committed to making computers as important to the company as cellular telephones have become.

To back up its commitment, Motorola has come out with a line of UNIX-based workstations incorporating its 88000 reduced instruction set computing (RISC) chip. These workstations will compete directly against Sun Microsystems Inc.'s SPARCserver and IBM's RS/6000 family. Motorola is stressing its "commodity-like pricing." The new computers sell for $23,985 to $59,985 and support from three to 32 users.

Motorola says its new push in computers doesn't bother its original equipment manufacturer (OEM) customers or other companies, like Data General Corp., that use its RISC chip. And it is still committed to its Delta series of midrange computers, including the 8000 RISC model it introduced in early 1989.

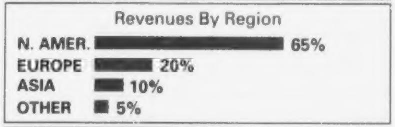
Motorola's total IS business—consisting of its computer group plus its Codex Corp. and Universal Data Systems data communications subsidiaries—racked up some $850 million in sales in calendar 1989, up 7.6% over 1988's $790 million. DATAMATION estimates that 1989 sales of Motorola's computer group sales alone were around $310 million, a slight increase from the prior year. Overall, Motorola's total company profits were up 11.9% in calendar 1989 to $498 million on revenues of $9.6 billion, compared with $8.3 billion in revenues in 1988.

Codex has been more aggressive in network management products. It introduced EtherSpan in 1989, the first in a series of products for bridging wide area and local area networks. Codex also came out with DualView, a modem add-on for managing Codex modems in an IBM NetView environment. Meanwhile, Motorola's Universal Data Systems subsidiary reported strong sales of its V32 full-duplex 9,600-baud modems.

Motorola's newest venture in data communications is its alliance with IBM on a nationwide wireless data communications service. For its part, Motorola will be providing the transmitters, handheld terminals, radio-powered modems and other devices. Analysts estimate wireless data communications services to be a multibillion-dollar market. *—Joe Kelly*

IS Revenues: $812 Million

REGION **31** **INTEL** WORLD **55**



INTEL CORP.
3065 Bowers Avenue
Santa Clara, CA 95051
(408)-987-8080

What's new at Intel Corp.? Last year, the world's premier chip maker showed increased signs of becoming a powerful performer in the computer systems business.

Although Intel once refused to talk publicly about systems revenues, Craig Barrett, Intel's newly appointed executive vice president and possible future successor to president and chief executive Andrew Grove, said early this spring that systems sales probably account for 25 to 30% of total revenues. Thomas Thornhill, who follows Intel for San Francisco-based Montgomery Securities, estimates that Intel's 1989 systems revenues were $812 million, just over a quarter of the chip maker's $3.1 billion total. He thinks that figure could rise to over $1 billion this year.

The company's total calendar 1989 revenues rose 9% over 1988's $2.9 billion. Although total profits were down nearly 14% for the year, Intel's fourth quarter income of $123 million—compared with $86 million the year before—represented a decided turnaround from the mid-1980s. During that period, the market was glutted with Intel's older chips, and revenues plunged by $265 million in 1985 and by another $99 million in 1986.

One reason for Intel's return to financial health is that it's running at near capacity to turn out leading-edge 32-bit microprocessors—the 80386 and 80486 lines—as personal computer manufacturers accelerate their demand for Intel's proprietary product family. As a result, the company has been accumulating cash that reached $1.6 billion last year, despite a $420 million outlay for new capital spending.

Intel's ongoing investment in new production facilities is beginning to pay off in both full computer systems as well as board-level and development systems. The company stepped up its systems activity in 1989 when it announced a supercomputer based on its i860 64-bit reduced instruction set computing (RISC) chip and earlier this year when it unveiled a line of 386- and 486-based UNIX workstations, called the MicroSystem line. Prices range from $6,295 to $14,595. The supercomputers are priced at $265,000 and up.

All of the systems are sold to original equipment manufacturers (OEMs) such as AT&T, which it supplies with PCs made at Intel's Systems Group in Hillsboro, Ore.

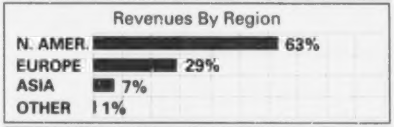
Intel's position in the systems world is causing some grumbling from its component customers, who argue that Intel is beginning to compete head-on with them. "We've been selling systems for nearly 15 years," declares Leslie Vadasz, president of the Intel Systems Group. "It's just that we are now in a more visible segment of the business—even though in the 32-bit PC field, we hold less than 5% of the market."

That apparently provides little comfort to some customers, including giant Houston-based Compaq Computer Corp. Early this year, Compaq invested between $5 million and $10 million in NextGen Microsystems, a fledgling San Jose company that is developing a chip compatible with Intel's 486 chip. Others gearing up for possible Intel chip clones include Integrated Information Technology and Advanced Micro Devices Inc. AMD dickered with Intel for a license to make the 386 microprocessor. However, Intel balked, and the issue is still in arbitration, with a decision not expected until the fourth quarter of this year.

Observers think it will be some time before Intel loses its profitable monopoly. First, any cloned chip will have to deliver a considerable performance improvement at a very attractive price. Second, Intel could litigate into the ground any attempt to step on its patented preserve. *—Tom McCusker*

IS Revenues: $784.7 Million

REGION **32** **CRAY** WORLD **56**



CRAY RESEARCH INC.
608 Second Avenue South
Minneapolis, MN 55402
(612)-333-5889

After Control Data Corp. withdrew from the supercomputer field in the spring of 1989, Cray Research Inc. remained as the only traditional supercomputer manufacturer in the United States. So what did the survivor do to take advantage of its new position? It created a competitor by slicing off a part of itself and forming a new and separate company.

In May, Cray Research announced that it would set up its founder, Seymour Cray, as head of Cray Computer Corp. in Colorado Springs and seed the new company with $150 million in cash, facilities and 200 employees. The spin-off became effective in November.

Cray Computer will continue to work on Seymour Cray's latest brainchild—the Cray-3—and market it once this gallium arsenide-based machine is fully developed sometime in 1991. The Cray-3 is expected to sell for upwards of $30 million and may offer speeds several times faster than traditional silicon chip technology now allows.

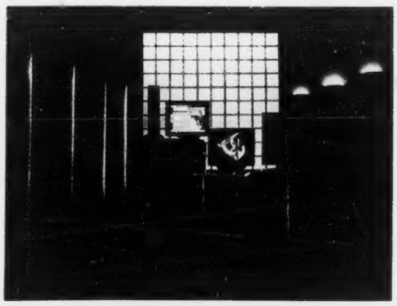
In the meantime, Cray Research will continue with the development of the Y-MP/16, the successor to its current top of the line Y-MP. A prototype of the new machine will be available in 1991, with deliveries set for 1992.

Why has Cray created a new competitor? The answer can be found in the recent financial performance of Cray Research. Signs of a slowdown were apparent in 1988, when revenues and earnings grew only 10% each. And last year, revenues rose only about 4% to $784.7 million, while earnings plunged more than 40% to $89 million. "Our strategy for 1990 is based on plans that call for revenues remaining flat this year again, and we hope that earnings will be better," says John Rollwagen, chairman.

As a result of last year's performance, Cray Research was forced to lay off 400 employees. Reasons cited by Cray for the cutbacks included increased domestic competition from Convex Computer Corp., Digital Equipment Corp. and IBM, and growing worldwide competition from Fujitsu Ltd. and NEC Corp.

With fewer projects to fund this year, Cray Research stands a good chance of improving its performance. Last year, the company spent $143 million on engineering and development, $40 million of which was lavished on the Cray-3. "The up side of the spin-off is that we are no longer funding the development of the Cray-3," says Rollwagen, "and the down side is that we lost Seymour Cray."

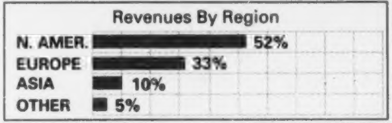
With the market for supercomputers charging toward lower priced units, Cray will introduce the X-MP/SE this year, priced at $2.5 million. This model uses newer integrated circuits, requires fewer parts and is less expensive to assemble than earlier Crays. *—Kurt Rothschild*



Apollo workstations bolstered HP's stand in the market.

IS Revenues: $769.3 Million

REGION **33** **ORACLE** WORLD **57**



ORACLE CORP.
20 Davis Drive
Belmont, CA 94002
(415)-598-8000

Predicting where Oracle Corp. might go next after nearly doubling the size of its business in a single year became a popular pastime in 1989. Oracle's 1989 revenues shot up by 94% to $769.3 million, while net income grew 74% to $97.7 million.

Nevertheless, murmurs that Oracle's aggressive marketing style was pushing the company toward unsustainable growth grew louder throughout the year, only to be confirmed this March when third-quarter fiscal revenues of $236.4 million and essentially flat earnings showed growth had slowed to 73%. Oracle's stock price plummeted by 30% in a day.

Wall Street's infatuation with Oracle may be in retreat, but Oracle's diversified software and services strategy continues to hit in full force. In the fall, Oracle announced Oracle Government Financials, a family of integrated accounting packages; Oracle Financials packages running under OS/2; and a suite of manufacturing programs.

Oracle seems committed to packages for future growth. "More and more of our customers are saying that I want you to be responsible for making sure our networking software, operating systems and applications all work together," says Peter R. Tierney, senior vice president. "We see this as a natural progression in our delivering of technology."

Already, there is evidence that the company's pitch of providing portable database management software will play as well in the applications arena.

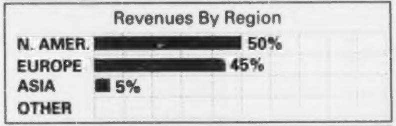
But some customers questioned Oracle's commitment to earlier offerings. The long-promised version of Oracle for Digital VAXclusters, for example, failed to materialize last year.

Oracle's primary strengths are in the minicomputer market and particularly in the Digital Equipment Corp. database arena, so how well it copes with the move toward open systems and client-server architectures will affect future growth. Already, about a third of Oracle's business is UNIX-related. "Right now, we are seeing an aggressive shift to UNIX in the midrange," says Tierney. Having launched support for Novell's Portable NetWare in February 1989 and Oracle Server for OS/2 last October, Oracle is also positioned to play across all major local area network offerings.

With about 48% of its revenues coming from overseas, Oracle is well situated for international expansion. Oracle's growing services business, now integrated under a subsidiary called Oracle Complex Systems Corp., is bringing in revenue by combining hardware, software and networking products in a single package. Future growth in the 100% range isn't likely by Oracle's own estimation. But, as long as the company can continue to balance its hyperactive growth against cash flow and customer service concerns, Oracle watching will remain a popular pastime. *—Paul Pinella*

IS Revenues: $740 Million

REGION **34** **GENERAL ELECTRIC** WORLD **58**



GENERAL ELECTRIC CO.
3135 Easton Turnpike
Fairfield, CT 06431
(203)-373-2211

General Electric Information Services (GEIS), the Rockville, Md.-based computer services arm of parent General Electric Co., had a busy 1989 at home and abroad, as evidenced by new products, alliances and a change in the executive suite.

DATAMATION estimates that GEIS chalked up about $550 million in revenues, up from slightly under $500 million in 1988. GE does not break out revenues and profits for the unit. GEIS, together with the parent company's $190 million third-party computer maintenance business, gave GE information services revenues of $740 million in 1989.

Strategically, GEIS continued to pursue a five-point program consisting of electronic data interchange services as the foundation business; services and applications built on top of EDI; a vertical industry marketing thrust for these services; joint ventures and alliances; and continued investment in new technology.

GEIS added about 2,000 clients to its EDI*EXPRESS System in 1989 for a total of about 6,500 clients worldwide. Many of these new subscribers came from the retail trade and transportation industries. A new EDI service introduced last year was DESIGN*EXPRESS System, which provides for the electronic transmission of computer-aided design documents.

On the EDI alliance front, GEIS was even busier. In February, GEIS signed an agreement with Interactive Techne-Group, Inc. of Cincinnati to provide a range of computer-aided design and manufacturing (CAD/CAM) services to DESIGN*EXPRESS clients. In June, an agreement was reached with Dallas-based MicroDynamics for MicroDynamics to resell DESIGN*EXPRESS services to the sewn-goods industry. In June, GEIS was awarded a one-year contract to supply EDI services to the General Services Administration's Federal Supply Service.

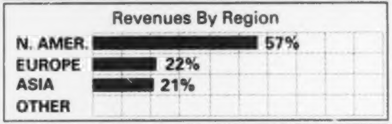
GEIS entered into other value-added network services agreements last year, as well. In June, Milan-based Stet, the Italian postal, telephone and telegraph (PTT) service, acquired 40% of a GEIS affiliate in Italy that resells network services. In August, Apple Computer Inc. extended for five years an agreement under which GEIS provides network services to Apple software developers, resellers and major accounts. The service is called AppleLink. GEIS also announced an agreement with GE American Communications for Ku-band satellite transponder services.

In October, Helene Runtagh became president of GEIS, succeeding James McNerney Jr., who was reassigned to GE Capital Corp. as executive vice president. Runtagh, who joined GE in 1970, says she doesn't expect to make significant shifts in strategy, but will be putting her "own English" on a few things.

Runtagh says she will continue to introduce competitive products in all vertical markets in which GEIS does business and may even add one more—hardware and software suppliers. At the same time, she says she is interested in doing business in newly liberated countries in Eastern Europe. "Clearly, we will get into the Eastern market," she says. "The only question is when." *—David R. Brousell*

IS Revenues: $704.9 Million

REGION **35** **CONNER PERIPHERALS** WORLD **60**



CONNER PERIPHERALS INC.
3081 Zanker Road
San Jose, CA 95134
(408)-433-3340

Conner Peripherals Inc. is heading for the record books. The San Jose-based disk drive manufacturer shipped its first products in 1987. This year, the company is expected to achieve sales of over $1 billion, making it the fastest growing manufacturing company in U.S. history. Conner reported calendar year 1989 revenues of $704.9 million, way up from 1988 revenues of $256.6 million. Meanwhile, net income rose to $41.4 million, up nearly 110% from the year before.

Conner got its fast start in the disk drive business through an alliance with Houston-based Compaq Computer Corp., which helped to finance the startup and bought most of its drives in its first year of operations. Compaq still owns 32% of Conner's shares and remains its largest customer.

Over the past three years, however, Conner has won orders from some 40 different companies, most of them in the personal computer sector. Over 40% of the company's sales are outside the United States. In Japan, Conner has been particularly successful in the burgeoning laptop market.

Conner dominates the world market for laptop drives. The company's latest products include 20-megabyte and 40MB quarter-height 3½-inch models, which are just over half an inch high, as well as an innovative 20MB 2½-inch drive. Low power consumption and high resistance to shock make the drives ideally suited for notebook and laptop computers.

"Since its inception, Conner's business focus has been to identify customer needs sooner and fill them faster than the competition," says Finnis Conner, Conner's chairman and founder. "Time to market is everything."

The company's strategy has been to work closely with its customers. While traditional manufacturers design drives, build them and then try to sell them to prospective customers, Conner designs drives to meet the specific needs of each of its customers and then builds them to order.

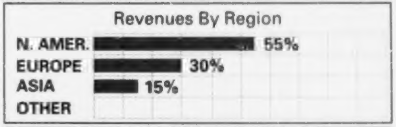
Critical to this business strategy is Conner's product technology. Conner tailors its drives to customers' specifications using embedded microcontroller chips that can be reprogrammed for each application. The microcode-based architecture provides Conner with increased flexibility and substantially reduces both electronic and mechanical component counts.

This year, Conner plans to expand its product line to include more high-capacity drives aimed at the high-performance personal computer and workstation segments of the computer market. The company will also begin production at a new plant in Scotland which will augment its production capacity in Italy, Singapore and the United States. The Italian operation is a joint venture with Ing. C. Olivetti & Co. SpA.

One cloud looms on the horizon. Following a dispute with its major supplier, the company is currently facing a shortage of thin film heads, the critical read/write mechanisms used in Winchester disk drives. Although Conner expects to be able to find alternative suppliers, the company acknowledges that the shortage may last until the third quarter of 1990, slowing its sales growth. *—Louise Kehoe*

IS Revenues: $696.4 Million

REGION **36** **3M** WORLD **61**



MINNESOTA MINING AND MANUFACTURING CO.
3M Center
St. Paul, MN 55144
(612)-733-1110

In the business it founded and dominates—backup tape cartridges—Minnesota Mining and Manufacturing Co. upped the stakes significantly in 1989 with a series of new products, including a cartridge capable of holding 525 megabytes, the highest capacity data cartridge available today.

3M's overwhelming position in data

cartridges—it has over 75% of the world market—gives it the leverage to keep prices stable, in stark contrast with the diskette market, where it also competes, and where intense competition has driven down prices in some sectors by as much as 60%. Santa Clara Consulting Group, which follows the media market, estimates that data cartridges accounted for well over half of 3M's $631.4 million sales of magnetic media products in calendar 1989, up nearly 12% over 1988's figures.

In addition to its new cartridges, 3M has provided tape drive manufacturers with a prototype of a cartridge capable of storing more than 1 gigabyte of data. Charles Calisto, marketing manager for data products at 3M, says the 1GB cartridge will be introduced this year.

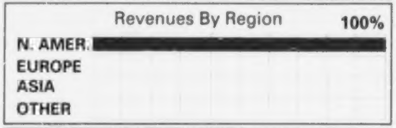
In 1989, 3M bought the 116,000-square-foot plant that IBM built in Tucson, Ariz., to manufacture 3480 tape cartridges. 3M has been selling its own Black Watch brand of the 3480 cartridge since IBM introduced the 3480 system in 1984. It now manufactures the Black Watch brand at the Tucson plant, as well as cartridges for IBM. In January of this year, 3M introduced its new Royal Brand tape cartridge for the IBM 3480/3490 systems.

3M is also involved in information systems through its Health Information Systems (HIS) group, which provides systems and services for hospitals, laboratories and medical groups. 3M's HIS group includes such product lines as Code 3, Med-Lab and Health Evaluation Through Logical Processing (HELP), which was acquired in 1987. DATAMATION estimates the group's 1989 sales to be around $65 million.

—*Joe Kelly*

IS Revenues: $687.6 Million

REGION		WORLD
37	**BLACK & DECKER**	63



BLACK & DECKER CORP.

701 East Joppa Road
Towson, MD 21204
(301)-583-3900

This is Black & Decker Corp.'s first year on the DATAMATION 100 list—and probably its last. The reason: The world's No.1 maker of power tools and a leading supplier of household products with $3 billion in sales wants to get out of the computer business.

Last July, Black & Decker acquired Emhart Corp., a $2.8 billion manufacturer of faucets, locks and lawn equipment. And along with Emhart came Emhart's newly established computer operation called the Information and Electronic Systems (IES) sector. IES was the result of Emhart's acquisition of two Virginia-based companies—Advanced Technology Inc. and Planning Research Corp.—which provide computer services to the government. Now operated as a separate unit by Black & Decker, IES is up for sale so that management can retire debt and focus on its core businesses.

Despite a decline in federal and defense spending growth, IES reported 1989 revenues of $704 million, compared with $656 million in 1988. Major new orders include a 10-year contract worth $150 million from the Navy to provide systems integration, software development and support services to the Navy's engineering data management operation. Another contract, for $7 million from the Department of Transportation, is for systems integration services to the Coast Guard. Much of last year's business came from extensions to major contracts, including the automated patent system developed for the U.S. Patent and Trademark Office, which is the largest automated document management system in existence.

Probably due to a dim outlook for growth in the government sector, Black & Decker is delaying plans to sell IES, for which the company once hoped to fetch some $500 million. But it may be forced to sell next year when the company's next debt repayment is due. Agreements with the banks from which Black & Decker borrowed nearly $4 billion require a $450 million debt reduction by this summer. The company will pay for this through the already-completed sale of an adhesives business and two smaller manufacturing divisions for $500 million.

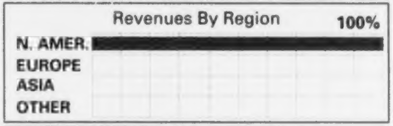
In 1991, the company must retire another $240 million in debt. Analysts speculate the firm may sell its computer division at that time. Black & Decker isn't commenting.

In fact, the only mention of IES in the company's annual report is that the division is for sale. Whereas last year Black & Decker operated IES almost as if it were two separate companies, in early 1990 it took steps to further consolidate its computer division, a ploy that may serve to attract future suiters. Early this year, the company named Wayne Shelton, former president and chief executive officer of planning research, as IES chairman, and Advanced Technology's former president and CEO, Scott Thompson, as president and CEO of the combined unit.

—*Tom McCusker*

IS Revenues: $660 Million

REGION		WORLD
38	**AMERICAN EXPRESS**	65



AMERICAN EXPRESS CO.

American Express Tower
World Financial Center
New York, N.Y. 10285
(212)-640-2000

In its credit card business, American Express Co. strives to stand apart from the competition by providing its card holders with a high level of personalized service. In its information systems business, however, the company aims for efficiency—processing high-volume back office jobs for hundreds of banks, mutual funds, hospitals, cable TV companies and other information-intensive enterprises at as low a cost and high a quality as possible.

American Express has been doing back office processing since the early 1980s, when it purchased First Data Resources Inc. Over the years it has acquired several other businesses, and in 1989 it established them as the American Express Information Services Co. (ISC), one of five major operating units of American Express.

In calendar year 1989, ISC posted sales of $660 million, up nearly 50% over 1988, but still a small part of American Express' $25-billion financial services empire.

The large growth in ISC was due largely to acquisitions, including the purchase of the Health Systems Co. from McDonnell Douglas Corp. The Health Systems Group of ISC provides processing services and turnkey systems to more than 800 hospitals in the United States, including Puerto Rico.

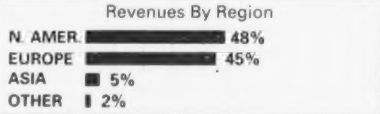
The ISC's main business is credit card processing. Through its First Data Resources operation, the ISC is the largest third-party processor of debit and credit card transactions, including accounts for Visa and MasterCard (but not the American Express Card, which is handled by American Express Travel Related Services Co.). The volume of bank card transactions handled by the ISC rose 25% during 1989, compared with 20% growth in 1988, thanks in part to the acquisition of the Eastern States Bankcard Association.

The ISC also processes mutual fund accounts. It got into that business in June of 1989 by buying the Shareholder Services Group of The Boston Company, which is part of Shearson Lehman Hutton, another American Express operating unit. In January of this year, ISC also acquired the mutual fund transfer agency of Mellon Bank NA, pushing the number of accounts ISC services to 6.5 million. *—Joe Kelly*

IS Revenues: $590 Million

REGION **39** **LOCKHEED** WORLD **66**

Revenues By Region



LOCKHEED CORP.
4500 Park Granada Boulevard
Calabasas, CA 91399
(818)-712-2000

Lockheed Corp. built a stable of information services, software and computer graphics firms through acquisitions in the early 1980s, but now it wants out of information systems. Lockheed announced last year it was pulling out of IS to concentrate on getting all it can out of the shrinking defense business. In addition, Lockheed has been under attack by corporate raider Harold Simmons, who wants to take control of the company. In calendar 1989, Lockheed's overall corporate sales fell 5% to $9.9 billion. Earning dropped precipitously, to $2 million, down from $624 million in 1988.

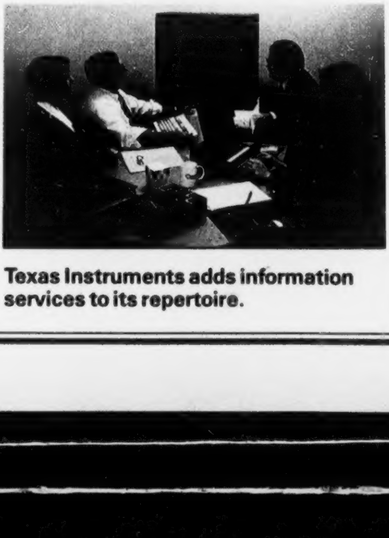
Lockheed sold off Dialog Information Services to Knight-Ridder Inc. in 1988, and last year it unloaded CADAM Inc., its computer-aided design (CAD) software firm, to IBM. Lockheed's sale of CADAM became a hot item when some Japanese firms evinced interest in it. Since many of IBM's CAD customers use CADAM software, it was important for IBM not to let the company fall into the hands of a major competitor. Lockheed couldn't get its asking price for CalComp, the computer graphics firm that came with the 1986 acquisition of Sanders Associates Inc., so the defense contractor decided to hang on to what has always been the biggest and most profitable part of its IS business.

Also still on the block is Metier Management Systems Inc., a leading vendor of project management software, which Lockheed acquired in 1985. Including CalComp, Metier and Datacom Systems Corp., which supplies services to state and local governments, Lockheed's IS revenues were about $590 million in 1989.

CalComp struggled to achieve overall sales of $480 million, which represents growth of about 13% in calendar 1989. The company saw strong demand in Europe, which accounts for about 45% of its sales, but business at home was hurt by a drop in business from IBM, CalComp's biggest original equipment manufacturer (OEM) customer.

Larry Sanders, CalComp's senior vice president of sales and marketing, says the slowdown in the CAD market and pressure to keep pace with the declining cost of workstations put pressure on CalComp in terms of how much it could charge for its plotters and digitizers. (CalComp sells only peripherals, having jettisoned its systems division in 1987.) According to Sanders, during the past five years the average selling price of a plotter has dropped 80%.

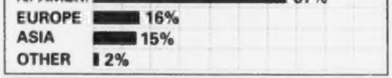
DrawingMaster, a wide-format thermal plotter that CalComp introduced last year for $15,000, is a lower cost alternative to laser or electrostatic devices. CalComp is also going after the business presentation market with its Wiz mouse system, which combines a mouse and digitizer pad. *—Joe Kelly*


Texas Instruments adds information services to its repertoire.

IS Revenues: $585 Million

REGION **40** **TEXAS INSTRUMENTS** WORLD **67**

Revenues By Region



TEXAS INSTRUMENTS INC.
13510 North Central Expressway
Dallas, TX 75243
(214)-995-2011

How can you tell that Texas Instruments Inc. today is a different company from the battered giant that president and chief executive officer Jerry R. Junkins took control of five years ago? One way is to look at the company's annual report. Contrary to TI's tradition of black-and-white graphics, the 1989 report features a color photograph on the cover. This small change is symbolic of the changes Junkins has wrought on a corporate culture that tended toward arrogance in years past.

Now, the Dallas-based computer company is listening to customers and competitors alike. Last year TI signed an agreement with General Motors Corp.'s Delco division to produce automotive sensors and began working with IBM on manufacturing automation projects. It also helped United Airlines Inc. develop a sophisticated gate assignment system based on TI's expert systems technology. TI reported IS revenues last year of $585 million, which is less than 10% of TI's total 1989 revenues of $6.5 billion.

A huge corporate restructuring last September brought about substantial changes in the way TI approaches IS. Several disparate business entities were merged to form the Information Technology Group as a way to refocus priorities on software and consulting. The new group was placed under the guidance of vice president John W. White, TI's former information systems director.

The group is in the midst of making a transition to industry standards, away from proprietary operating systems of the past. While TI will continue to support established customers, industry standard products—such as the MS-DOS laptop computers introduced in October—will likely become more common. Meanwhile, TI will continue nurturing its growing UNIX business through a family of multiuser systems based on Motorola

Inc.'s 68030 microprocessor.

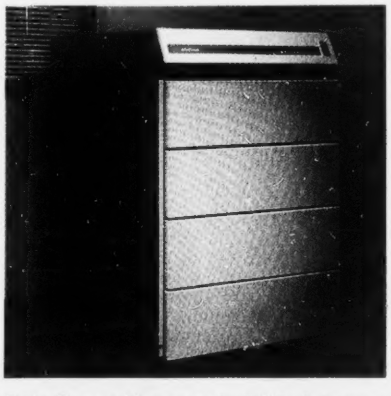
TI predicts that by 1995 more than 50 to 60% of the Information Technology Group's revenues will come from software and consulting services. Currently, more than 80% of the group's sales come from hardware.

On the semiconductor side, TI has been working to stay competitive. Through joint ventures last year, the company was able to build expensive semiconductor plants after making arrangements with governments overseas to give it access to cheaper capital.

TI formed a joint venture in Taiwan with Acer Inc., whereby Acer supplies most of the money and TI furnishes the expertise to build a $250 million microelectronics factory. In Italy, TI received $100 million in government incentive loans and is starting out as the majority owner of a new $250 million facility. In March of this year, TI entered into its largest joint venture, a deal with Kobe Steel Ltd. of Japan to build a $350 million factory dedicated to the production of application specific integrated circuits (ASICs). Even with these agreements, TI has yet to match the low capital costs of most firms in Japan.

However, TI's Japanese future looks bright. Last year, following years of litigation, the Japanese government's patent office handed down a favorable ruling to TI, granting it a patent for an original semiconductor design. Some analysts estimate that the ruling could produce up to $2 billion worth of revenue for the Texas company.

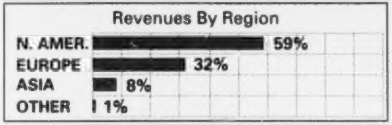
One big question remains with regard to TI's profitable defense electronics business. With cutbacks likely in many defense programs, TI could feel the effects in the months and years ahead. *—Bob Francis*



Data General hopes to build its future on Aviion.

IS Revenues: $556 Million

REGION		WORLD
41	LOTUS	70



LOTUS DEVELOPMENT CORP.

55 Cambridge Parkway
Cambridge, MA 02142
(617)-577-8500

Old habits are hard to break. That's what such industry luminaries as Microsoft Corp.'s Bill Gates and Computer Associates International Inc.'s Charles Wang discovered when they tried to lure Lotus' 1-2-3 customers away to the promised land of their spreadsheets. For, despite highly publicized delays in replacing its five-year-old 1-2-3 release 2.01, an array of development problems, departures of marketing and development talent and a crimp in its 1988 earnings and sales, Lotus' customers stayed with their tried-and-true package until its successor, the long-awaited release 3.0, finally surfaced last summer.

The problems, though, didn't seem to hurt the company's calendar 1989 earnings prowess or its spreadsheet market share, which remained at about 70%, according to analysts. Sales, meanwhile, climbed 19% to $556 million last year, and net income was up 15% to $68 million, completely reversing the 18% net profit decline of 1988.

The availability of 1-2-3 release 3.0, which was written in C and enhanced with a variety of features such as access to remote database management systems, three-dimensional spreadsheets and presentation quality graphics and output, did not come without a price. Release 3.0 runs only on 286-based PCs and up, with a minimum of 1 megabyte of memory—that is, on only about 65% of PCs sold today, according to experts. Thus, ironically, the biggest competitor to release 3.0 may be the new release 2.2, an interim, updated version of release 2 that runs on 8088/8086-based PCs.

Release 3.0 was but one of the products Lotus rolled out last year. Others included a 1-2-3/M for mainframes; a 1-2-3/G for OS/2 and Presentation Manager; and, in an agreement with Tandy Corp., a new version for the largely unpenetrated small-business and home computer market, Lotus-DM. Also, in its bid to make 1-2-3 available on all leading hardware platforms, Lotus is working on DEC VMS and industry standard UNIX versions.

Business professionals use three tools for their analysis and decision making: spreadsheets, databases and graphics. Lotus' strategy in a nutshell is to integrate and enhance the three at all possible levels to create what chairman Jim Manzi refers to as the industry's preeminent "analysis engine." Since delivering data to the desktop is the vital first step in its plans, Lotus has targeted the communications and DBMS portions as most strategic to its goal.

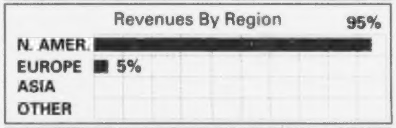
On April 6th this year Lotus signed a letter of intent to merge with LAN leader, Novell Inc. of Provo, Utah. The merger was expected to be completed in July, but talks fell apart in May. Lotus was to have a 51% stake of the new company, operating Novell as a wholly owned subsidiary. Novell has in the neighborhood of 60% of the LAN business and had sales of around $422 million in 1989.

Lotus last year acquired 15% of the innovative relational DBMS concern Sybase Inc. of Emeryville, Calif. and has an option to increase its stake to 25%.

—Ralph Carlyle

IS Revenues: $539.8 Million

REGION		WORLD
42	SHL	71



SHL SYSTEMHOUSE INC.

50 O'Connor Street, Suite 501
Ottawa, Ontario, Canada K1P 6L2
(613)-236-9734

The major suppliers of mainframe and minicomputer systems aren't the only ones being forced to accommodate the power of personal computers, workstations and the networks connecting them. Distributed-computing technology is making systems integrators broaden their focus beyond the traditional mainframe operating environment.

Acquisitions have proved to be the broadening experience needed by SHL Systemhouse Inc., Canada's biggest systems integrator and the largest Canadian

THE DATAMATION 100

firm entirely devoted to information systems. Its purchases of ComputerLand Canada and Computer Group PLC in Britain have given the company enough revenues to crack the DATAMATION 100 for the first time.

"The acquisition of ComputerLand enables us to provide complete end-to-end support in today's new environment in the same way the traditional systems integrator provided mainframe support," explains Peter A. Sandiford, president and chief operating officer of Systemhouse. The acquisition of ComputerLand Canada, which took place in late 1988, coupled with the 1989 purchase of Computer Group, more than doubled Systemhouse's sales from $240 million Canadian dollars ($194 million) in calendar 1988 to C$639.1 million ($540 million) in 1989.

Although retailers typically aren't included in the DATAMATION 100, ComputerLand Canada is a worthy exception. Unlike most retailers, it always has focused primarily on serving corporate customers. Although ComputerLand Canada continues to operate independently, its parent is already depending on the subsidiary's PC expertise in several major contracts. One is the fire department dispatching system that Systemhouse created for the city of Los Angeles. The system is based on IBM PS/2 microcomputers and Motorola Inc. Mobile Data Terminals.

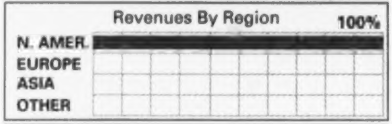
As a systems integrator, Systemhouse has eschewed the popular strategy of focusing on specific niche markets, such as financial services or manufacturing. "Our view is that we are called in to provide innovative applications of technology," explains Sandiford. "Our clients come to us to reduce the risk and time it takes to implement innovative systems."

Systemhouse's sales have traditionally been divided equally between the United States and Canada. In the late 1980s, the company made a big push to get more business from the U.S. federal government, but it is now feeling the effects of the heightened competition in that market, exacerbated by spending cutbacks in Washington.

Systemhouse is likely to be one of the most talked-about systems integrators of 1990 because Kinburn Technology Corp., a management holding company that owns 50.1% of the stock of Systemhouse, became strapped for cash in late 1989 and put its majority stake in the company up for sale. *—Joe Kelly*

IS Revenues: $502.2 Million

REGION **43** | **MARTIN MARIETTA** | WORLD **73**


Revenues By Region

MARTIN MARIETTA CORP.
6801 Rockledge Drive
Bethesda, MD 20817
(301)-897-6000

Despite record corporate revenues of $5.8 billion, 1989 was not a good year for Martin Marietta Corp.'s Information Systems Group (ISG). The division's revenue from non-Martin Marietta business plummeted 32% in fiscal year 1989 to $502.2 million, after increasing nearly 10% in 1988. The company says the big decline was mainly due to 1988 revenue figures inflated by the sale of British subsidiary Hoskyns Group PLC and the completion of a communications systems contract.

Tightening federal budgets and enormous changes in Eastern Europe and the Soviet Union have left few defense contracts on ISG's plate. The division continued work on a five-year, half-billion dollar pact to develop and operate the National Test Bed, a computer simulation network for the Strategic Defense Initiative, but dwindling defense dollars have forced ISG to look elsewhere for work.

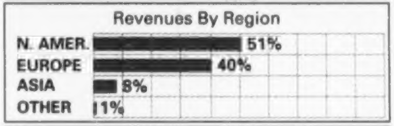
One area the company has looked to is the air traffic control business. ISG completed close to 30 air traffic control modernization projects in 1989. The projects ranged from surveillance radar systems that manage takeoffs and landings at airports to new wind shear alert systems installed in Denver and New Orleans. A similar contract was awarded to ISG by the Department of Defense for modernizing military air traffic control systems. And the company also installed 31 automated weather observation systems last year—the first of 1,000 systems the company will install over the next 10 years.

After winning a contract from the U.S. Postal Service, ISG entered a new market—automated mail-sorting machines. The division will manufacture and install 267 sorters in postal offices throughout the country. The company also won a contract to supply software services to the Social Security Administration's data-processing facility in Baltimore and to the National Agricultural Statistics Service of the U.S. Department of Agriculture.

ISG also looked to air traffic control contracts outside the United States to fill the void left by shrinking dollars at home. In Canada, ISG completed modernization of the Canadian air traffic control system. Also, Martin Marietta was awarded a technical study contract by the Eurocontrol Experimental Center in France, which advises many European countries on air traffic control. Through ISG, Martin Marietta will assist the center in improving computer simulation methods for air traffic management. *—Mike Ricciuti*

IS Revenues: $495 Million

REGION **44** | **NYNEX** | WORLD **74**


Revenues By Region

NYNEX CORP.
1113 Westchester Avenue
White Plains, NY 10604
(914)-644-6000

Among all the Bell operating companies, NYNEX Corp. goes the furthest to stake out a clear position in information systems, thanks in large measure to an ongoing series of acquisitions. In 1987, NYNEX bought Business Intelligence Services, the British banking software firm, and a year later acquired Mountainside, N.J.-based AGS Computers Inc., which offers software and services primarily to financial institutions.

Those two companies combined are now the mainstays of NYNEX's Information Solutions Group (ISG). Last year, ISG's revenues hit $495 million, up from $430 million the year before, but still just a fraction of NYNEX's overall 1989 revenues of $13.2 billion.

NYNEX stayed on the acquisition trail in 1989, adding two more software and services firms: Tampa, Fla.-based Teco Technologies Inc., which serves utility companies, and LeRoux, Pitts and Associates Inc., a Clearwater, Fla., firm specializing in point-of-sale applications for banking, retail and government clients. Since the mid-1980s, NYNEX has built up ISG through over a half-dozen such acquisitions.

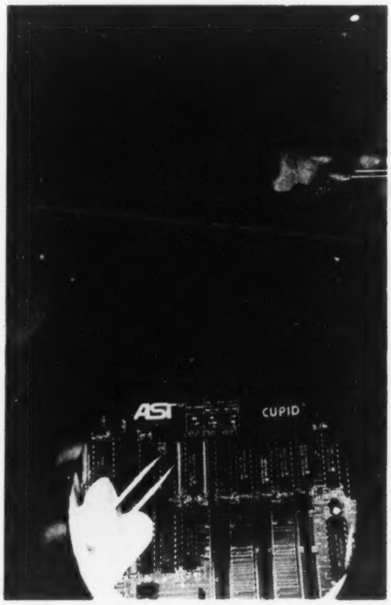
ISG's biggest piece of business to date

is Empire Net, the $180 million voice/data network it is helping put together for New York state. Yet more recent contracts have also been significant. Last August, NYNEX picked up another $33.5 million deal to install automatic payment systems for the parking lots of the three major New York City area airports. Both Tandem and LeRoux, Pitts are subcontractors on that contract.

Another significant contract was secured by NYNEX Computer Services, a division of ISG, to manage the network of computer facilities and data communications services that support the delivery of the PRODIGY service in the NYNEX area. PRODIGY is an on-line information service delivered through Prodigy Services Co., a joint venture between IBM and Sears, Roebuck and Co. in White Plains, N.Y.

Although over a third of its business is with banks and securities firms, ISG has not been hurt by the downturn in financial services, maintains Engkvist. "[Financial companies] are still spending a lot to strengthen their internal systems," he says. Fortunately for NYNEX, much of that spending is still coming from a healthy overseas market. ISG, which does about 35% of its business internationally, is even benefiting from the opening of the Eastern Bloc—last year, NYNEX sold two banking systems in Hungary.

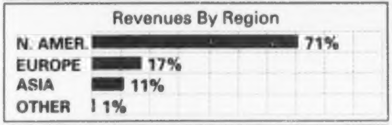
—Joe Kelly



AST keeps a close eye on research technology.

IS Revenues: $482 Million

REGION 45 **AST RESEARCH** WORLD 76



AST RESEARCH INC.
16215 Alton Parkway
Irvine, CA 92713
(714)-727-4141

What a difference a year makes. As AST Research Inc. entered 1990, it was coming off a quarter in which it made $7.4 million and a year in which it positioned itself as a leading supplier of personal computers. A year earlier, it had faced an $8.9 million quarterly loss in an uphill struggle to become something more than a supplier of enhancement boards for all types of desktop systems.

The company is still in the board business, but the bulk of its sales now come from complete systems. It has limited its enhancement products to IBM and IBM-compatible PC enhancement boards, selling off operations that make boards for systems manufactured by Apple Computer Inc. and Digital Equipment Corp. Its chief focus—and the source of nearly 85% of its $482 million in revenues in 1989—is building and making PCs.

The major introduction of the year for the company wasn't a new product. It was a new blueprint for its future PC products based on the Cupid-32 architecture. The design, unveiled in January 1989, allows users of AST PCs to switch from their old microprocessors as more powerful microprocessors become available. Such flexibility enabled the company to be among the first to ship systems with Intel Corp.'s 80486 microprocessor. By the end of the year, the company's best-selling computers were its 80386-based machines, which accounted for 60% of company sales in the fourth quarter of 1989.

Like PC-compatible rival Compaq Computer Corp., AST markets its PCs chiefly through retailers and other resellers. Unlike Compaq, it also sells systems to other computer companies—such as Tandem Computers Inc. and Texas Instruments Inc.—for resale. Such original equipment manufacturer (OEM) customers constitute about 8% of AST's sales.

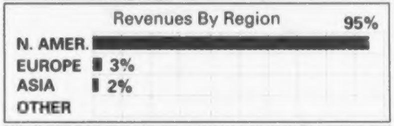
Nearly a third of AST's revenues now come from outside the United States, including a heafty 10% of total sales coming from the Far East. Access to Japan and other Far Eastern markets is made all the easier by AST's investments in manufacturing plants in Hong Kong and Taiwan. In fact, about 70% of all the PCs sold worldwide by AST are made in the company's Taiwan plant.

Potential products for the future include a PC-based network server machine, possibly with dual processors and similar to the Compaq SystemPro; a laptop computer; and a workstation based on reduced instruction set computing (RISC) technology.

—Bob Francis

IS Revenues: $479 Million

REGION 46 **SCIENCE APPLICATIONS** WORLD 77



SCIENCE APPLICATIONS INTERNATIONAL CORP.
10260 Campus Point Drive
San Diego, CA 92121
(619)-546-6000

Among the contracts Science Applications International Corp. (SAIC) garnered last year was one from the Veterans Administration for a network that will tie all the agency's hospitals and offices together. The $84 million contract has options that could double it in value. Another contract was from the Federal Aviation Administration for bomb detectors to screen luggage at airports for plastic explosives. The $20 million contract could grow larger as more airports install the $1 million systems.

These types of contracts typify SAIC's efforts to reduce its dependence on U.S. government defense contracts as its main source of revenue. "Our strategy is shifting, to get more heavily involved in the nondefense government area and, to a smaller degree, in commercial business," says Jim Russell, senior vice president of corporate business development at SAIC's office in Virginia Beach, Va.

Defense work still accounted for nearly two-thirds of SAIC's more than $1 billion in total corporate revenue in calendar 1989. And the United States remained the company's biggest geographic market—contributing 90% of its revenues. Of SAIC's total corporate revenues, $479 million were IS sales—up from $386 million a year ago, when the company's total sales reached $865 million.

SAIC is an employee-owned company organized into four separate business areas: national security; environment and health; energy; and high-technology products. The company's 11,500 owners consult, engineer systems, analyze programs and integrate systems. And the businesses have done well, bringing the company up from its $150 million start in the 1980s.

SAIC expects to grow 15% in 1990 and regards the environment and energy areas as particularly promising. The company's computer software and telecommunications capabilities are considered to be the critical technologies necessary to continue SAIC's rate of growth in traditional markets as well as in its newly developing spheres. *—Kurt Rothschild*

IS Revenues: $452.3 Million

REGION		WORLD
47	WYSE	78

Revenues By Region

N. AMER.	65%
EUROPE	25%
ASIA	5%
OTHER	5%

WYSE TECHNOLOGY

3471 North First Street
San Jose, CA 95134
(408)-473-1200

Wyse Technology has been a corporate survivor ever since the company's upward spiral thudded down to earth two years ago. Many observers predicted that the successful terminal and monitor maker would beat a quick retreat from the PC business after it sank into a wave of red ink in 1988.

Last year, Wyse weathered a tumultuous time amid rumblings that all or part of the company would be sold. For the third fiscal quarter, which ended December 29, 1989, Wyse reported a net loss of $7.1 million on quarterly revenues of $112.4 million, a slight improvement from the financial hemorrhaging earlier in the year. For calendar 1989, Wyse posted revenues of $452.3 million and a loss of $21.2 million.

By 1990, Wyse had also made improvements to its product family, successfully making the transition to 386 PCs and centering its computer lineup on a newly introduced flagship entry level 286-based model. Wyse even managed to increase its share of the market for general purpose terminals to 48% in 1990.

By year's end, the rumored friendly takeover by Channel International, a group of Taiwanese investors, materialized with a tender offer that was accepted in January 1990. Channel International bought Wyse for $164.5 million and took it private. Morris Chang was installed as chairman and chief executive officer of the company, replacing former Wyse chairman and CEO Bernard Tse, who became vice chairman. C. Daniel Wu, the new president, was brought in to manage the day-to-day affairs, but the rest of Wyse's management team remained for the most part intact.

The new Wyse shot out of the chute in 1990 with the fruition of a three-year project that catapulted it into the multiuser UNIX systems marketplace. As a result of that contract, Wyse introduced two multiuser, multiprocessor machines for distributors, along with its own version of UNIX System V/386. Designed for as many as 128 users, each system employs up to six Intel 836 processors. An optional board is available for upgrading the systems with 486 chips.

Selling advanced systems exclusively through distributors will certainly test Wyse's mettle during 1990. But if the company can continue to leverage its acknowledged strengths—low-cost, Taiwanese manufacturing and quality U.S. engineering—it could regain its former market luster. *—John McMullen*

IS Revenues: $450 Million

REGION		WORLD
48	DUN & BRADSTREET	80

Revenues By Region

N. AMER.	80%
EUROPE	20%
ASIA	
OTHER	

DUN & BRADSTREET CORP.

299 Park Avenue
New York, NY 10171
(212)-593-6800

For blue chip information services provider Dun & Bradstreet Corp., it was a year of cautious optimism.

In calendar year 1989, the company's revenues grew slightly to $4.3 billion, up from $4.2 billion the year before. Meanwhile, net income increased more than 17% to $586 million from $499 million the previous year. Although earnings met D&B's expectations, officials hint of a possible earnings decline in 1990, based largely on softness in the company's credit services sector.

Digital's data center in Marlborough, Mass.

D&B's marketing research information business plays a major role in the company's global strategies. This business includes Nielsen Marketing Research, which provides point-of-sale consumer response for manufacturers and retailers, and Nielsen Media Research, which serves TV advertisers and networks. Donnelley Marketing, a direct-marketing agency, also figures prominently in D&B's global strategy, as does IMS International, which serves the pharmaceutical industry by providing competitive marketing data.

"For our customers, the battle for their customers' revenue is becoming more real-time," says Robert Weissman, president and chief operating officer of D&B. "That's driving the demand for more real-time information systems both internally [for them] and from external information service vendors like us."

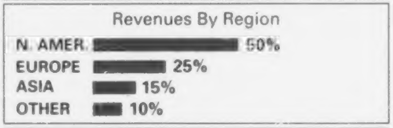
Another of D&B's mainstays continues to be its credit risk management service. "That's a business that [by itself continues] to do well—over half a billion dollars worth of revenue a year," says Weissman.

Perhaps the best candidate for long-term growth potential lies with D&B's newest division, Dun & Bradstreet Software Services, comprising former applications software leaders McCormack & Dodge Corp. of Natick, Mass., and Atlanta-based Management Science America Inc. (MSA), which D&B acquired last November. John Imlay, chairman of D&B Software and former chairman and chief executive officer of MSA, expects the software group to generate $450 million in 1990, about the same as it did in 1989, and to grow at the industry rate of 15% per year after that. For the short term, he says the emphasis will be on contined improvement of the existing product lines. "You have two major presences in the mainframe software markets with some 10,000 customers combined," says Imlay.

Customers are now waiting for Dun & Bradstreet Software Services to produce a promised next generation of software that blends the two product lines. According to Imlay, the first fruits of this new generation will be ready in about three years. Afterwards, the company will help customers embark on a five-year migration process. Says Imlay: "95% of our combined customer base is IBM mainframes, so the priority will be on developing SAA- [Systems Application Architecture] compliant software, with secondary focus on open systems and UNIX." D&B's real challenge in the short run will be to bring together two very tough competitors and mold them into a well-managed, efficient organization. *—John McMullen*

IS Revenues: $450 Million

REGION **49** **ERNST & YOUNG** WORLD **79**



ERNST & YOUNG
787 Seventh Avenue
New York NY 10019
(212)-830-6000

Accounting firms have been playing at the edges of the IS world for most of the 1980s. Only Arthur Andersen & Co. had built the critical mass to be a major player, but now there is Ernst & Young. Ernst & Young was formed in 1989 from the merger of Ernst & Whinney and Arthur Young & Co., one of two mergers that turned the Big Eight into the Big Six. (The other was Deloitte Haskins & Sells and Touche Ross & Co., which became Deloitte & Touche in December.)

Because the growth of auditing and tax consulting has slowed considerably in recent years, management consulting is a key avenue for continued growth. At Ernst & Young, management consulting was a $750 million business in calendar 1989, with information consulting and services accounting for some $450 million.

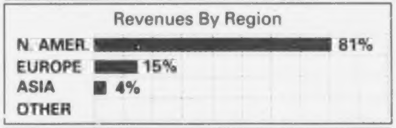
Both firms were engaged in consulting before the merger. Ernst was by far the larger of the two and, in contrast to Young, drew many of its consulting customers from among its auditing clients. The ability to offer a full set of integrated services in both auditing and consulting is going to be an important part of Ernst & Young's strategy, according to Richard Welsh, national director for IS marketing.

Like Andersen & Co.'s Andersen Consulting subsidiary, Ernst & Young offers clients a range of services for both designing and implementing systems. Ernst & Young's new Navigator series of system design, implementation and project management tools is aimed at helping clients fully exploit today's CASE methodologies. Welsh says Navigator represents a major overhaul of the system design tools both firms were using prior to the merger to take advantage of newer information-engineering techniques, such as data modeling and error checking.

Ernst & Young has also established the Center for Information Technology Strategy in Boston to offer research and advisory services for users and vendors of information technology, a move that puts Ernst & Young in direct competition with such consulting firms as Gartner Group Inc. and the Index Group. The Advanced CASE Technology Center (ACTC) that Ernst & Young operates in Ann Arbor, Mich., is an outgrowth of the alliance that Arthur Young established in the mid-1980s with industry analyst James Martin and Atlanta-based KnowledgeWare Inc. *—Joe Kelly*

IS Revenues: $447.2 Million

REGION **50** **MAXTOR** WORLD **81**



MAXTOR CORP.
211 River Oaks Parkway
San Jose, CA 95134
(408)-432-1700

In the cutthroat competition of the disk drive market, Maxtor Corp.'s strategy has been to claim the high ground by maintaining industry leadership in drive capacity and speed. So far, the strategy seems to be working. The company's calendar 1989 revenues soared 32% to $447.2 million and net income rose 27% to $13.9 million.

The eight-year-old San Jose company has concentrated its efforts on high-performance drives for the workstation and server markets, while also offering drives for top-of-the-line personal computers. The company's latest products include, for example, a 340-megabyte 3½-inch drive and a 1.7-gigabyte 5¼-inch drive. Both set industry records for data storage capacity.

Maxtor is the undisputed leader in the market for these very high-capacity drives, according to industry analysts. Its 760MB 5¼-inch disk drive is without rival in the workstation segment.

"We will always push technical frontiers," says George Scalise, Maxtor's president and chief executive officer. To that end, Maxtor is also pioneering the market for erasable optical disks, which it first announced in 1988. Last year, Maxtor formed Maxoptix, a joint venture company with Kubota of Japan to manufacture and market its optical disk drives.

Like most of its competitors, Maxtor has shifted its high-volume manufacturing offshore. The company produces its most popular products in Malaysia and Singapore, while also maintaining some manufacturing operations in the United States.

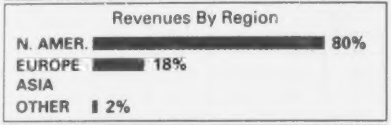
In a surprise move that could significantly expand Maxtor's role in the disk drive industry, the company is acquiring Miniscribe Corp. of Longmont, Colo., for which it entered a successful $46 million bid in a bankruptcy court-ordered sale in April 1990. The transaction is expected to close on July 1st.

The acquisition will provide Maxtor with a new entrée into the low end of the disk drive market with Miniscribe's 1-inch high 3½-inch disk drive, expanding its potential market into the high-volume PC drive sector.

With the acquisition of Miniscribe, Maxtor has taken on a major challenge to rebuild, as its new subsidiary, a company that has suffered serious financial and management problems. As it enters the low-end 3½-inch disk drive market with Miniscribe's products, Maxtor will also find itself in the most brutally competitive sector of the disk drive industry, a sector it had previously avoided. *—Louise Kehoe*

IS Revenues: $445 Million

REGION **51** **KODAK** WORLD **82**



EASTMAN KODAK CO.
343 State Street
Rochester, NY 14650
(716)-724-4000

Eastman Kodak Co. tried to energize its IS business in 1989 by reorganizing. "We began to realize at the end of 1988 that we were too fragmented," says Lawrence J. Matteson, a 25-year Kodak veteran who is head of the new Information and Imaging Systems Group overseeing IS businesses, including Kodak's effort in optical disks.

The creation of the Information and Imaging Systems Group was part of a companywide reorganization at Kodak—the fourth in five years. Kodak cut some 4,500 jobs in 1989 and took a $445 million charge that cut calendar 1989 earnings to $529 million, down 62% from the $1.4 billion earned in 1988. Sales rose by nearly 8% to $18.4 billion. As part of the restructuring, Kodak has sold some 20 businesses, including Verbatim Corp., which was the single biggest component of Kodak's IS business.

A casualty of the floppy disk price wars engulfing the industry in 1989, Verbatim was sold in April to chemical maker Mitsubishi Kasei Corp. In selling Verbatim, Kodak became the second U.S. firm to bail out of the magnetic media market. Last December, Indianapolis-based Anacomp Inc. sold its Xidex Corp. floppy disk business to Hanny Magnetics Ltd. of Hong Kong.

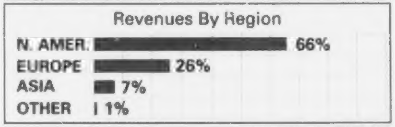
Prices for 3½-inch floppy disks fell as much as 60% in 1989. Although Verbatim had come out with innovations to keep sales and prices up, such as Teflon-coated disks, that wasn't enough for Kodak, which has been under pressure to boost earnings. Kodak is understood to have sold Verbatim for about $190 million. According to Santa Clara Consulting Group, Verbatim's 1989 revenues were just over $190 million, accounting for nearly half of Kodak's total IS revenues of $445 million. Kodak bought Verbatim in 1985 for $175 million. Kodak retains ownership of products codeveloped with Verbatim, such as the 5¼-inch erasable optical disk introduced last year. Kodak also offers a 14-inch optical disk system.

Verbatim was one of several IS acquisitions Kodak made in the 1980s. The others include Atex Inc. in electronic publishing, Eikonix Corp. in digital processing and, most recently, Interactive Systems Corp. in UNIX and Yourdon Inc., a consulting firm and software developer. The idea behind all of these acquisitions, like Kodak's 1988 purchase of Sterling Drug Inc., is to generate new revenue streams to counterbalance the slowing sales growth of its traditional photographic products.

Like Verbatim, Kodak's other acquisitions have struggled in the marketplace. Atex, although still one of the leading electronic-publishing systems, is battling the rise of PC-based desktop publishing and its own reliance on proprietary systems. It is now converting its systems to UNIX and introducing Macintosh-compatible products. —*Joe Kelly*

IS Revenues: $426.4 Million

REGION **52** **NOVELL** WORLD **84**



NOVELL INC.
122 East 1700 South
Provo, UT 84606
(800)-453-1267

During a year of growing competition and industry change, Novell Inc. navigated the local area networking waters with an admiral's skill. The company reported revenues of $429.2 million in calendar 1989, up a hefty 40% from the previous year. One reason for the increase was international sales, which by year's end accounted for 34% of revenues. Meanwhile, net income also grew at a healthy 52% clip to $52.6 million.

At the end of 1989, as at the beginning, industry analysts crowned Novell's NetWare network operating system the market leader, with market share estimates ranging from 52 to 70%.

Although the strong earnings were expected, Novell's financial performance seems particularly remarkable during a year when the company's primary product announcements were preparatory technologies, geared less toward 1989 revenue than anticipated future growth.

The announcement of Portable NetWare in January, for example, paved the way for traditional minicomputer companies to license the NetWare operating system code for development and sale in conjunction with proprietary networking schemes. Data General Corp., NCR Corp., Prime Computer Inc. and Wang Laboratories Inc. were among the most prominent companies to license Portable NetWare last year.

In May, Novell announced NetWare 386, the company's specialized server operating system for platforms based on the Intel Corp. 80386 microprocessor. Although widely praised by analysts for its speed and power, NetWare 386 wasn't actually shipped until September. Then, in June, Novell bolstered its management and development team with the acquisition of Excelan Inc., a supplier of Ethernet communications products for Apple Computer Inc. Macintosh systems and IBM PCs and compatibles.

"What we have announced at this point is a basic platform for systems development," says Kanwal Rekhi, the former president of Excelan, who now serves as executive vice president of product development for Novell. "We're preparing for the 1990s, for the next phase of network computing."

According to Rekhi, future extensions to NetWare 386 will include additional support for the Macintosh, for UNIX and for large computer network environments from vendors such as Digital Equipment Corp. and IBM.

Meanwhile, the company's flagship NetWare 286 operating system continued to dominate 1989 sales. Although Novell declined to provide a breakdown, Dataquest Inc., a market research firm based in San Jose, estimates that last year Novell sold some 180,000 copies of NetWare 286 and NetWare 386.

During the year, Novell continued its migration toward the software side of the networking scale. Following a pattern established several years ago, Novell further distanced itself from hardware sales by quietly dropping some of its PC Ethernet products in favor of increased emphasis on higher margin software products. By the end of the year, software accounted for 72% of net sales. For the year as a whole, 67% of sales were software related, as compared with 54% in 1988.

In the 1990s, Novell hopes to lead the transition from small work group networks to enterprisewide schemes incorporating a mix of mainframes, minicomputers and personal computers. Toward that objective, Novell announced this April its intention to merge with Lotus Development Corp. of Cambridge, Mass. Many analysts initially expressed doubt as to the synergy between spreadsheet king Lotus and local area network chieftain Novell. Now the industry may never know; talks between the companies collapsed at presstime. The marriage was to have been consummated this summer. The newly formed company would have had combined 1989 annual revenues of just under $1 billion, placing it on the same playing field as arch-rival Microsoft Corp., over in Redmond, Wash.

—*Cheryl Snapp*

IS Revenues: $426.4 Million

REGION		WORLD
53	MENTOR	85

Revenues By Region

N. AMER.	52%
EUROPE	27%
ASIA	19%
OTHER	2%

MENTOR GRAPHICS CORP.
8500 Southwest Creekside Place
Beaverton, OR 97005
(503)-626-7000

Mentor Graphics Corp., which is a newcomer to the lofty ranks of the DATAMATION 100, has not suffered from the financial hiccups common to so many high-tech companies. By the end of 1989, the company, located in the lumbering town of Beaverton, Ore., had logged 29 consecutive quarters of sales growth and 17 consecutive quarters of rising profits. That kind of mileage has solidified Mentor's position as the leading vendor of turnkey systems that aid in the design of chips, printed circuit boards and other electronics products.

That premier position was bolstered last year when Hewlett-Packard Co. acquired floundering Apollo Computer Inc., Mentor's main hardware supplier. Virtually all of the company's turnkey business is based upon Apollo workstations, which Mentor then integrates with software. In fact, until this year, Mentor's software only ran on Apollo's hardware. The HP takeover provides Mentor and its customers with reassurance that Apollo will be able to keep on supplying workstation wares.

Still, the pressure on Mentor to offer its products on more than just Apollo platforms continued building last year. Finally the company capitulated, announcing that it would port its software to the hardware of Sun Microsystems Inc. The move to Apollo's arch rival should help Mentor attract new customers since Sun workstations run UNIX and support open standards.

—*Alden Hayashi*

IS Revenues: $413.9 Million

REGION		WORLD
54	3COM	87

Revenues By Region

N. AMER.	60%
EUROPE	20%
ASIA	20%
OTHER	

3COM CORP.
3165 Kifer Road
Santa Clara, CA 95052
(408)-562-6400

According to Bill Krause, 3Com Corp.'s chairman and chief executive officer, 1989 was the year that 3Com underwent a "ritual of passage from a start-up to a major industry leader." Indeed, it was a roller coaster year for the networking and communications pioneer, which began its transition from being a low-end product supplier to a more services-oriented systems firm.

3Com began the year on an upbeat note after strong international and major account sales led to record high revenues and earnings. A flurry of multiprotocol product announcements and a development and investment deal with Hewlett-Packard Co. also raised hopes for a strong year.

Then the tables turned. 3Com's heavy reliance on its Ethernet card sales, which had accounted for more than 60% of sales, became apparent after chief rival Novell Inc. dropped the prices of its cards. Afterward, 3Com's profits dragged to a new low. Disappointing sales of its highly touted 3+Open networking software for the OS/2 environment, a lack of product focus and an aggressive direct sales push that frightened resellers added to 3Com's woes. Wall Street reacted to disappointing fourth-quarter results. By the end of June, 3Com's stock had dropped by over $10 from its high of $27.65 per share, a third of its per share value.

In an attempt to rebound from its financial troubles, 3Com began a restructuring last September. It merged the Software Products Division with the Distributed Systems Division headed by 3Com founder and Ethernet inventor Robert Metcalfe, who is now vice president of marketing. The company also announced a new product strategy, which it hoped would refocus 3Com as a high-end product and services company.

By November, 3Com's picture brightened following the announcement of the 3S/500, a powerful network server, which impressed analysts and confirmed the company's move toward higher end systems. Unlike earlier marketing efforts for other 3Com products, which often divided the company into separate hardware and software camps, the 3S/500 was positioned as a single powerful system that would be cooperatively marketed by all.

Analysts expect a broad range of network management systems and tools from 3Com this year, including multivendor connectivity products and services.

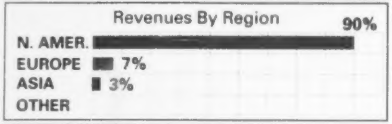
More changes are sure to follow. "We have a renewed focus on networking products," says Krause. "In the '90s, the essential ingredient will be the ability to manage the network." —*Tom Wood*

James McDonald, CEO, leading Prime's restructuring plan.

THE DATAMATION 100

IS Revenues: $402 Million

REGION		WORLD
55	**EVEREX**	88



EVEREX SYSTEMS INC.
48431 Milmont Drive
Fremont, CA 94538
(415)-498-1111

Two years ago, Everex Systems Inc. was barely a blip on the then-booming PC sales screen, although its income from peripherals and enhancement products was more than respectable. Since then, growing sales from its own PC-compatible systems have pushed the company to a much more visible position. Currently, PCs account for over 55% of Everex's revenues, up from 29% in January 1988. Everex's calendar 1989 revenues were $402 million, up 22% from 1988; net income climbed to $21.3 million, up an even better 103%.

Unlike competitors that gained strength by increasing sales overseas or by tapping into the lucrative laptop market, Everex stuck to its knitting by selling bread-and-butter 80286- and 80386-based PCs to mostly domestic accounts. Of Everex's total sales, 90% are in North America. According to Alan H. Bushell, vice president of operations, much of the company's success can be tied to its telemarketing department, which maintains close ties with the Everex vendor network of 13,000 independent computer stores and national distributors such as Ingram-Micro D. The feedback gleaned from telemarketing is used in determining what products should be brought to market and when.

With executive offices located in the midst of the telemarketing department, direct customer feedback is assured. As a result, Everex claims that tight links between telemarketing and manufacturing help it to get products to market faster than its competitors.

In addition to full computer systems, the company's sales of peripherals and PC enhancement products continue to be strong, with IBM and Macintosh peripheral sales up 27% and 4%, respectively. Although total Macintosh peripheral sales accounted for a relatively small part of the revenue mix, company officials expect new products to revive the Macintosh business later this year.

Everex introduced several new computers last year, including a number of 386-based models. Currently, says Bushell, PC sales are rapidly shifting to 386-based machines. Earlier this year, the company introduced a UNIX workstation based on Motorola Inc.'s 88000 reduced instruction set computing (RISC) chip and a PC based on Intel's 80486 chip.

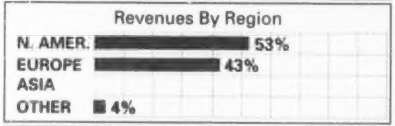
According to Bushell, the company's expanding product line is no fluke. "We view ourselves as offering the connections between different operating environments," he says. "With our line of computers, peripherals and enhancement products, you can go from DOS to OS/2 or to UNIX with very little trouble."

Bushell cites a laser printer that Everex recently introduced as an example of his company's integration capabilities. The printer supports Hewlett-Packard Co.'s PLC printer protocol, as well as PostScript, thereby creating a single printing solution for customers with a mixture of PCs and Macs. "That kind of bridge building is what we're good at," he says.

—Bob Francis

IS Revenues: $397 Million

REGION		WORLD
56	**MAI BASIC FOUR**	90



MAI BASIC FOUR INC.
14101 Myford Road
Tustin, CA 92680
(714)-731-5100

MAI Basic Four Inc. punctuated the end of the decade with a financial stroke that could only have been attempted in the financial freestyle of the 1980s. It tried to acquire a company many times its size and came very close to disaster as a result.

When declining sales of minicomputers, the company's bread and butter for 20 years, threatened its well-being, MAI reacted. The company first tried to sell itself. Failing that, it charged after $1.5 billion Prime Computer Inc., a Natick, Mass.-based minicomputer company, in a widely publicized battle that endured eight months.

MAI lost the fight and much more. It was out millions of dollars, a president (Bill Patton) and its nice guy image. Securities analysts characterized MAI as in disarray and in a tailspin. Well, almost. MAI was suffering from declining sales—revenues dropped 10% to $397 million in calendar 1989. And it was losing money—net losses totaled $40 million for the 12-month period. But it was changing, too.

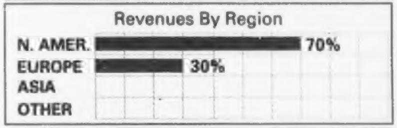
MAI stopped making hardware. It began a new life as a systems integrator, selling computers made by Japan's Acer America of San Jose, and Sequent Computer Systems Inc. of Beaverton, Ore. This new identity fully surfaced last December when MAI introduced its GPx series of systems. They offer what the company calls a dual universe—a combination of the UNIX operating system and MAI's long-standing Business Basic, or BOSS, operating system. One version in the series was a desktop GPx 340 model, the other a floor-standing GPx 440, acquired from Acer. Its larger model, the GPx 70 series, developed jointly with Sequent, was introduced early this spring.

MAI named a new president. Tapped was Fred Anderson Jr., a 12-year MAI veteran who most recently was its chief financial officer. Anderson succeeded William Weksel, who had replaced Patton and continues as the company's chief executive officer and chairman. As chairman, he succeeded Bennett S. LeBow, who became chairman of the board's executive committee. LeBow, who orchestrated the Prime bid, acquired MAI in a leveraged buy out in 1985. He heads Brooke Partners L.P., which has a 54% stake in MAI.

—Tom McCusker

IS Revenues: $394.2 Million

REGION		WORLD
57	**QUANTUM**	91



QUANTUM CORP.
1804 McCarthy Boulevard
Milpitas, CA 95035
(408)-432-1100

Two years ago, Quantum Corp. bit the bullet. The personal computer hard disk drive manufacturer took a $17 million write-off and phased out its production of 5¼-inch hard disk drives to focus on the emerging market for 3½-inch drives.

At the time, most drive makers were anticipating a gradual shift toward the more compact drives. Yet Quantum was ahead of the pack in recognizing how quickly the transition would occur. The company's decision to put all of its energies into the new generation of disk drives enabled it to double its sales and assume a competitive lead in the industry. For calendar 1989, Quantum reported revenues of $394.2 million and net income of $41.3 million.

Quantum's 3½-inch ProDrive is used by Apple Computer Inc. in its Macintosh SE30 and Macintosh IIcx computers, as well as by Sun Microsystems Inc., which designed Quantum's 105-megabyte drives into its SPARCstation 1 workstations. Over the past year, the company has added several other computer companies to its customer roster, including Hewlett-Packard Co. and Next Inc.

Quantum focuses on the markets for high-performance personal computers and low-end workstations with drive capacities in the 40- to 210-megabyte range. The company is expected to expand its product line up to about 300MB this year, in line with industry trends. Quantum has also introduced 1-inch-high drives aimed at the laptop computer market.

Quantum's motto is "Do it once and do it right," says Stephen M. Berkley, chairman and chief executive. The disk drive manufacturer is obsessive about product quality and claims that its products have the highest mean time between failures of any in the industry. Still, Quantum's quality image took a dent last year when problems emerged with some of the drives it supplied to Apple. The problem was limited to some 2% of the drives shipped, Quantum says, and occurred only when the drives were used in extreme temperatures. Although quickly resolved, the episode came as a significant blow to the company.

Quantum's conservative, quality-oriented culture makes it a good match with its Japanese partner, Matsushita Kotobuki Electronics Industries (MKE), which manufactures Quantum's high-volume products, including its popular 40MB, 80MB and 100MB drives. Quantum builds higher capacity versions of its ProDrives at its own newly refurbished California plant.

The link with MKE was initially established by Quantum's subsidiary, Plus Development Corp., which, with its Hardcard product, pioneered the market for add-on hard disks mounted on circuit boards. These boards are typically used to upgrade floppy disk personal computers.

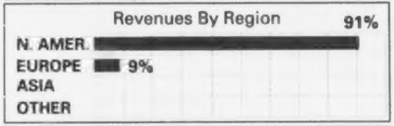
The add-on market and Plus Development's sales are now declining as personal computers are increasingly sold with hard disks already installed. One of the challenges Quantum faces this year is compensating for that trend.

Quantum is also facing stiff competition in the 3½-inch drive market. The company has a development program under way for a 2½-inch drive, which it plans to introduce this year. Quantum does not, however, anticipate a rapid switch to this new item.

—Louise Kehoe

IS Revenues: $390 Million

REGION		WORLD
58	SHARED MEDICAL	92



SHARED MEDICAL SYSTEMS CORP.
51 Valley Stream Parkway
Malvern, PA 19355
(215)-251-3164

Infected by the same malaise that has afflicted the health care industry, Shared Medical Systems Corp. has suffered through sluggish financial times of late. Taking the scalpel to some of its operations, the 20-year-old company cut costs and head count last year in an effort to improve its overall health. To stimulate revenue growth, SMS rolled out a series of new products in 1989, most notably the IBM-based Invision health care information system, introduced in September.

Despite lethargic financial performance, SMS is hardly a terminal case. The leading provider of health care information systems and software for two decades, SMS has stamina that should serve it well once the ailing health care industry snaps back and begins spending once again.

"They have cut their costs some and tightened things up. They've got things under control," says Stephen McClellan, first vice president at Merrill Lynch & Co. in New York City. "They've never had an unprofitable quarter, and they've always had terrific cash flow." On the downside, however, "they also don't seem to be moving aggressively into any new markets," says McClellan. "They're just not growing very much." Sales in 1989 rose just 3% to $390 million, while net income dropped 21% to $23.1 million.

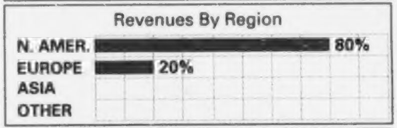
A good part of SMS' revenue continues to come from its traditional turnkey systems, which run on Digital Equipment Corp. VAX computers. At year's end, the firm won half a dozen hospitals over to its Allegra turnkey health care system.

The company has also added a new twist to its turnkey trade by instituting a version of time-sharing. Rather than sell a hospital a $1 million system, SMS now offers to set up the same turnkey system in its own data center and bill the customer on a basis similar to time-sharing. Merrill Lynch's McClellan says the company is getting a fair amount of that business, although it didn't affect last year's revenue very dramatically. "You won't see it in their numbers, because it's spread out over years," he explains.

But spreading business out for the long term is characteristic of Shared Medical's overall approach. Despite the health care industry's lack of vigor, "Shared Medical doesn't seem to be tempted to sell out or do an LBO," says McClellan. "They're sticking things out." *—Linda Runyan*

IS Revenues: $388.6 Million

REGION		WORLD
59	DELL	93



DELL COMPUTER CORP.
9505 Arboretum Boulevard
Austin, TX 78759
(512)-338-4400

In its first full year as a public company, Dell Computer Corp. found itself in some turbulent waters. Once a consistent performer, steadily releasing new products based on Intel Corp. chips, the company fell behind in introducing a personal computer based on the 33-megahertz version of the 80386 microprocessor.

One reason for the delay was Olympic,

an ambitious PC project that Dell hoped would land it in the front ranks of PC manufacturers. Instead, Olympic largely drained the company's manpower and its $17 million research and development budget. The result: the formerly fleet-footed Dell found itself somewhat far from the cutting edge in new products.

Olympic apparently was designed to separate Dell from the rest of the PC clone pack by incorporating proprietary circuit boards and chips using reduced instruction set computing (RISC) technology. After the project fell behind amid rising costs, the company finally scaled it back, although some research continues.

Management changes at the five-year-old firm also contributed to company woes, notably, the resignation of E. Lee Walker as president. Walker, considered a stabilizing factor, will remain on the company's board. But his move, made for health reasons, raised the specter of the company's early years of management thrashing. Walker's functions will be assumed by Andrew R. Harris, vice president of marketing, and Joel J. Kocker, president for U.S. sales and operations.

Despite the growing pains, Dell turned in a respectable year with good revenues, although income was down sharply partially due to the expensive Olympic project. For its 1989 fiscal year, which ended January 31, 1990, Dell reported revenues of $388.6 million and net income of $5.1 million, down from the $14.1 million level of the year before.

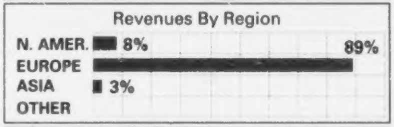
Michael S. Dell, chairman and chief executive officer, says sales growth can be attributed largely to rapidly expanding overseas markets, which accounted for 23% of the company's sales during its fiscal year, up from 15% the prior year. Dell launched its overseas division in June 1987 and now operates subsidiaries in Britain, France and West Germany.

Another factor fueling the company's growth, says Dell, is a shift toward large accounts with *Fortune* 500 companies. Where once Dell relied almost exclusively on its telemarketing group to sell individual PCs by mail order, corporate accounts now constitute 40% of sales. "We've had good penetration in getting on the short list of corporate accounts," says Dell. Part of the reason for the change is that many big companies are buying PCs in large quantities, and Dell has made inroads by catering to the needs of corporate support personnel.

As was true of most PC firms last year, revenues at Dell shifted rapidly from 286-based PCs to 386-based machines. Dell's high-powered 386 machines now constitute 47% of revenue, up from 26% in 1989. Products introduced last year include a long-awaited 80386SX-based machine, which shipped in November. The company's first laptop product, also based on the 386SX chip, also appeared in November. This March, the company released a 20MHz version of the 386SX computer and a 486-based PC using the Extended Industry Standard Architecture (EISA) standard. At the same time, the company introduced the Dell Station, a UNIX/DOS workstation configured with UNIX office automation software from Irving, Texas-based Uniplex Integration Systems Inc. *—Bob Francis*

IS Revenues: $377.9 Million

REGION **60** **TANDON** WORLD **96**



TANDON CORP.

405 Science Drive
Moorpark, CA 93021
(805)-523-0340

It's not stretching things to say that the history of personal computing would have been a lot different without Tandon Corp. Tandon was a manufacturer of disk drive components in the late 1970s when the first PCs began to appear. Founder Sirjang Lal (Jugi) Tandon sensed an opportunity and plunged in as a manufacturer of 5¼-inch drives. Sales went from $3 million in 1977 to $300 million in 1983. The company got so cocky, it ran an advertisement saying it no longer competed in disk drives because "you can't compete when you've got no competitor."

But plenty of competitors appeared, Tandon misread the market for hard disk drives and, by 1985, the company was running an annual loss of $135 million.

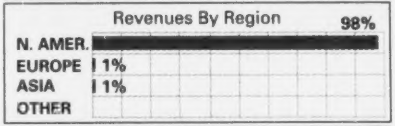
Now it's back again, but this time around, Tandon isn't making disk drives, it's producing the whole computer. And by concentrating on sales in Western Europe—it drew some 89% of its revenues from Europe in 1989—the company has emerged as a real PC success story. Last year, sales rose 22% to $377 million. Although it still lost $4.3 million, that's better than the $20 million loss in 1988. For the last half of the year, Tandon was running well in the black. And, in the first quarter of this year, Tandon reported a healthy 13% increase in revenues to $105 million and continued profitability of $7 million.

Tandon's success has been based more on marketing than technology. Its distribution network assembled by Chuck Peddle, a pioneer in PCs, is considered to be one of the best in the business. But lately Tandon has also been polishing its image as an innovator. At the end of the year, it began shipments of its new Tandon 486 PC, sporting a removable optical disk drive.

Tandon's strong European distribution network makes it a likely takeover candidate for any company—European, Japanese or U.S.—that wants to bolster its market presence in PCs in anticipation of the lowering of trade barriers in Europe in 1993. Rumors abound that Sirjang Tandon would be more than happy to unload his company if the price is right. *—Joe Kelly*

IS Revenues: $359.2 Million

REGION **61** **BOEING** WORLD **98**



BOEING COMPUTER SERVICES

2800 160th Avenue, S.E.
Bellevue, WA 98008
(206)-655-1131

Although Boeing Computer Services is one of the smallest divisions of $22 billion parent corporation The Boeing Co., it had a respectable $1.5 billion business base in 1989. The division's primary role is providing computer and telecommunications support for Boeing's own operations, with an emphasis on sister divisions that cater to commercial airplanes, defense and space. Boeing Computer Services also markets its systems integration experience to government and commercial clients.

In calendar year 1989, the division produced $359 million in external sales, a 31% increase over the $274 million in outside revenues posted the previous year. Government contracts continued to account for the vast majority of the division's external business. Commercial contracts, in contrast, garnered $52 million of the $359 million sum.

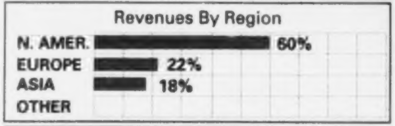
Boeing Computer Services is a major subcontractor to AT&T on the FTS2000 program, a $4.5 billion Federal Telecommunications System contract signed in late 1988. The program is designed to establish and service an automated information system for use by 1.3 million federal government employees. And last year, the division captured a $105 million contract to provide information services to the Naval Weapons Center in China Lake, Calif.

Boeing Computer Services provides data-processing services to the National Aeronautics and Space Administration's (NASA) solid rocket booster assembly and refurbishment program and, is developing an automated information system for the space station *Freedom*.

Boeing Computer Services made headlines this March when division President Mike R. Hallman departed to serve as president and chief operating officer for Microsoft Corp. The new head of the division, Art Hitsman, is a 40-year Boeing veteran who began his Boeing career in aircraft design. —*Cheryl Snapp*

IS Revenues: $344.6 Million

REGION		WORLD
62	CONCURRENT	100



CONCURRENT COMPUTER CORP.
106 Apple Street
Tinton Falls, NJ 07724
(201)-758-7000

Concurrent Computer Corp. finished its merger with Massachusetts Computer Corp. (Masscomp) in 1989 and also overhauled its line of real-time superminicomputers. Of course, that's a tall order for one year, so it's no surprise that Concurrent's sales went on automatic pilot at $344.6 million, up marginally over the 1988 pro forma results DATAMATION reported last year. The company also reported losses of $13.3 million for 1989.

Concurrent pioneered the real-time supermini in the mid-1970s when it was the data systems division of Perkin-Elmer Corp. A substantially upgraded version of the OS/32 operating system it developed back then is still the basis of its 3200 line of proprietary systems. Concurrent's main customers are technical users, but it also is going after the faster growing commercial real-time market.

Last year, the company combined three factories into two and also reoriented its production to take advantage of more third-party specialists in areas like board manufacturing and surface mount assembly. "We tried to do it in 90 days and ran into lots of problems," says James K. Sims, Concurrent's president and chief executive officer. "We should have planned an extra 90 days."

In January, Concurrent slimmed down, cutting some 240 employees (about 7% of its work force), a move that is expected to save some $12 million a year. Because it carries a heavy debt load of some $200 million, primarily from the Masscomp merger, Concurrent can't afford any excess fat.

Concurrent extended its proprietary systems with its new MicroThree and MicroFive series. On the UNIX side, it introduced its first reduced instruction set computing (RISC) system early this year, the series 8000. It also came out with RT-NET, a series of connectivity products that will enable customers to link Concurrent's systems with those of Digital Equipment Corp. and Sun Microsystems Inc.

Concurrent's sales mix is still heavy on the proprietary side. According to Sims, the changeover to more open systems sales depends on how fast Concurrent can get UNIX to deliver real-time performance. "We're getting UNIX under a 500-microsecond response time, but it is still not the performance you will get from proprietary systems. It's going to be one or two more generations before we get that." —*Joe Kelly*

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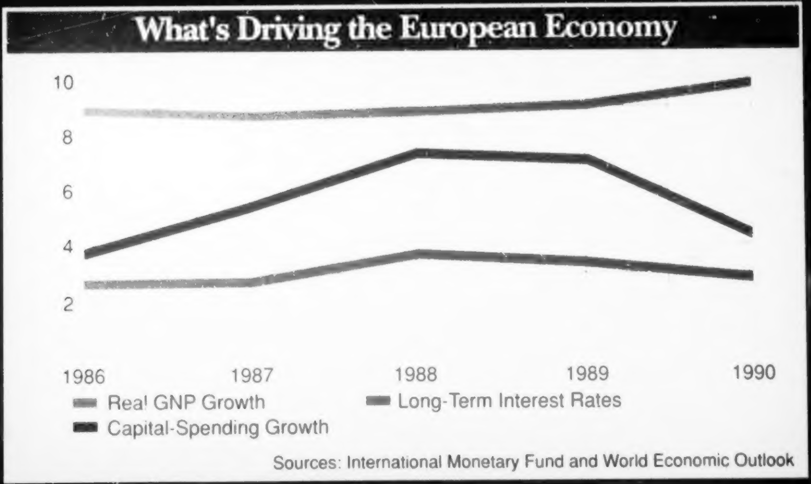
Circle 36 on Reader Card

Breaking barriers in Eastern Europe will truly mean a single common market.

Groupe Bull's Lorentz agressively seeks opportunities on the European frontier.



What's Driving the European Economy

Sources: International Monetary Fund and World Economic Outlook

THE DATAMATION 100

British Telecom networks worldwide.

As Western Europe reshapes itself into a common market, will Bull, Olivetti and Siemens be strong enough to keep U.S. and Japanese suppliers from capturing any more of the market?

European Unity Creates New Superpowers

"The [European] Community shall adopt measures with the aim of progressively establishing the internal market over a period expiring on 31 December 1992. . . . The internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of this Treaty."

Those words, from the treaty establishing the European Economic Community, signal the creation of the world's largest market for information technology. On January 1, 1993, the 12 member nations of the European Community will create what is often called the United States of Europe. Under EEC rules, trade barriers between nations will be as lax as barriers

BY CATHERINE BARNAT

between New York and Connecticut. This internal market will be the largest integrated economic area in the world, with more than 320 million consumers and a gross domestic product of some $5 trillion.

Moreover, the EEC sees information technology as an integral part of a United Europe. The Single European Act that decreed the establishment of an internal market also designated the creation of a "European technological community" as one of the goals of Community policy.

But the community may find it has less and less control over the definition of *Europe* in the 1990s. The dramatic events of the past year in Eastern Europe, such as the impending reunification of Germany, have made the Continent a much larger economic force to be reckoned with. The relaxation of trade restrictions with the East Bloc, particularly on technology, leaves forecasters with a question mark for the future of the entire continent.

The only certainty here is that demand for information technology will grow; by how much is anyone's guess. Most market forecasts do assume that growth in sales of computer, telecommunications and office automation equipment in Europe will outpace that of the United States, just as it has over the past two years.

Europe already accounts for 30% of the world's spending on information technology, second only to the United States (40%) and well ahead of Japan (15%), according to the EEC. While demand in the United States has been sluggish at best in the last two years, Europe's thirst for computer equipment has continued to surge. In fact, several U.S. computer suppliers have been more than candid in admitting that their European sales were the only factor that kept them in the black last year.

The European Elite

European companies with the best IS revenues for 1989

EUROPEAN RANK	WORLD RANK	COMPANY	IS REVENUES ($ MILLIONS)
1	8	Groupe Bull	6,465.4
2	9	Siemens	6,010.6
3	10	Olivetti	5,573.3
4	18	NV Philips	2,814.8
5	19	Nixdorf	2,792.6
6	22	STC	2,643.4
7	28	Memorex	2,056.6
8	32	Alcatel	1,800.3
9	46	Nokia	1,191.9
10	48	Cap Gemini	1,103.4
11	54	Mannesmann	819.1
12	59	Amstrad	717.0
13	62	British Telecom	692.5
14	64	Finsiel	662.5
15	68	Racal	573.9
16	69	Comparex	566.0
17	83	SD-Scicon	431.5
18	89	Sligos	400.7
19	95	Sema Group	378.6
20	99	Norsk Data	358.1
21	109	Logica	314.0
22	114	Software AG	294.0
23	118	GSI	277.1

There are some indications that European demand may slow this year. Reasons for the slowdown include some sluggishness in major economies such as Britain and France, as well as a rise in interest rates. But suppliers are still certain that European demand for computers will outpace that of the United States. Vittorio Cassoni, managing director of Italy's Ing. C. Olivetti & Co., even predicts that computer buying in Europe will not follow the U.S. pattern of steep peaks and valleys in orders.

The Single-Market Bonanza

The freeing up of trade restrictions is the driving force behind Europe's demand for information technology. An EEC-commissioned study known as the Cecchini Report estimates that the total economic benefit of the 1993 changes will be around $200 billion, leading to the creation of some 2 million new jobs.

Banks, accounting firms and other financial services companies are expected to be the first European industries to attempt to cash in on the potential economic bonanza promised by the single market. Once strictly national institutions are already opening branch offices throughout Europe, adding personnel and updating operations so that they can more effectively compete on an international scale.

Manufacturers, also aware that they must expand beyond national boundaries in order to compete, are investing in new plants and offices. All this expansion is universally assumed to translate into more computer purchases, software upgrades and data communications improvements.

"The technological preparations for the common internal market have unmistakably begun," says Francois Salle, president of the European Association of Manufacturers of Business Machines and Information Technology (Eurobit). "Investments involve future-oriented business decisions based on long-term perspectives, so it is only too understandable that investments in plant come out on top in the forecasts of economic expansion."

The problem for European information technology suppliers, however, is how to get a larger piece of that investment. The EEC estimates that European suppliers only account for 24% of the world's computer production. That is not enough to keep them in the black. The British Computer Society even predicts that the EEC's trade deficit in information technology will increase from $12 billion dollars in 1989 to $17 billion by 1995.

What's driving the deficit upward is that more European users are buying U.S.- or Japanese-made information systems than European suppliers are able to export. Although most European countries do support a so-called national champion—a native supplier that sells lots of computers at home and virtually none across the border—that is hardly enough to compensate for the amount of business IBM and other foreign suppliers do in the region.

Siemens AG of West Germany, the largest infor-

Big Exporters in Europe

The European companies with the most IS sales outside their home markets

	1989		IS REVENUES			
	RANK	COMPANY	N. AMER.	EUROPE	ASIA	OTHER
1	8	Groupe Bull	1,939.6	4,073.2	0.0	452.6
2	28	Memorex	1,069.4	678.7	287.9	20.6
3	10	Olivetti	501.6	4,514.4	390.1	167.2
4	18	NV Philips	591.1	2,054.8	168.9	0.0
5	9	Siemens	541.0	5,409.6	60.1	0.0
6	62	British Telecom	484.8	138.5	34.6	34.6
7	22	STC	264.3	2,167.6	105.7	105.7
8	32	Alcatel	108.0	1,476.2	0.0	216.0
9	68	Racal	229.6	258.3	57.4	28.7
10	48	Cap Gemini	209.7	893.8	0.0	0.0

Revenue figures are in millions of dollars.

mation technology supplier headquartered in Europe, is a classic national champion. About 70% of the $3.2 billion in revenue generated last year by its Data and Information Systems Division came from within West Germany. Another 2% came from the rest of Europe. U.S.-owned IBM, on the other hand, produced nearly 35% of its $62.7 billion in 1989 revenue by selling systems in Europe. Such size makes IBM the biggest information technology supplier in every European country in which it does business.

Europe's native information technology suppliers are even further behind when it comes to innovation. Although the region's computer scientists are considered among the best in the world, there have been no significant commercial breakthroughs in computers from Europe. Europe cannot boast of a homegrown Apple Computer Inc.

"The U.S. leads in computers, software and services and in some areas of industrial automation," Eurobit stated in a briefing paper for the EEC. "Japan leads in components, consumer electronics and some office products, while Europe is third except in telecommunications and software and services."

Grow or Be Gone

European suppliers don't have many choices these days. Broad-based suppliers intent on surviving through the 1990s must merge, cooperate and pay attention to opportunities in Eastern Europe. If they don't, they're likely to be out of the information systems business. Niche suppliers must focus on creating value in software and services.

Groupe Bull SA of France, for example, has turned itself into one of the world's leading suppliers of personal computers by acquiring Zenith Data Systems Corp. The acquisition, which took place last year, is part of a grand strategy by Bull. The key to the company's growth, says company chairman Francis Lorenz, is increasing its reach into the European market before the changes of 1993 go into effect. Two-thirds of Bull's revenues already come from outside France.

Another champion, Siemens, decided to increase its clout by acquiring its largest West German competitor, Nixdorf Computer AG. The merger creates an enterprise that in 1988 generated $9 billion in information systems revenues.

More mergers among European information technology suppliers are expected during the next five years. Some analysts speculate that only three large European groups will exist in 1995—Siemens, Bull and an Olivetti combination. Few expect Finland's Oy Nokia, Norway's Norsk Data AS, Great Britain's Amstrad PLC and the Netherlands' NV Philips' GL to still be independent. Olivetti has already announced that it is holding talks on possible cooperation with NV Philips as part of "a stage of diffused negotiations with a number of European companies for other possibilities of collaboration." Britain's STC has spent the past year looking for a foreign partner for its International Computers Ltd. (ICL) subsidiary.

Joint research ventures also are popular in Europe. They give suppliers the collective clout to back the kinds of massive research projects that individual companies in the United States and Japan can fund on their own. The EEC is a big proponent of such joint ventures, allocating nearly half of its research budget for information technology projects. Two of its better known efforts are the European Strategic Program for Research in Information Technologies (ESPRIT), which covers basic research and development in information technology, and RACE, for work aimed at integrated, broadband communication.

But, to date, only one commercial product has evolved from any of these ventures—the transputer

Where Europe Excels

European companies with the highest software sales

	1989 RANK	COMPANY	SOFTWARE REV.	IS REV.
1	9	Siemens	638.3	6,010.6
2	8	Groupe Bull	517.2	6,465.4
3	10	Olivetti	497.7	5,573.3
4	64	Finsiel	391.5	662.5
5	95	Sema Group	378.6	378.6

European companies with the highest datacom sales

	1989 RANK	COMPANY	DATACOM REV.	IS REV.
1	9	Siemens	1,345.7	6,010.6
2	32	Alcatel	756.4	1,800.3
3	68	Racal	573.9	573.9
4	18	NV Philips	457.4	2,814.8
5	62	British Telecom	332.4	692.5

Revenue figures are in millions of dollars.

microchip, manufactured by Inmos of Britain. The transputer, introduced five years ago, offers twice the speed of Intel Corp.'s 80386, has four communications channels and, for under $10,000, can be configured into a desktop computer, giving it more power than a Digital VAX 8000 minicomputer. Unfortunately, a lack of software stunted the transputer microchip's growth, and now Intel's i860 superchip can outperform it.

So, bigger companies and bigger research budgets may not necessarily translate into bigger market share for the European players. "The ability to sell in foreign markets depends very much on the resources you have—the ability to recruit staff," says Jerry Sanders, an independent computer consultant in London. The biggest beneficiaries of a single common market in Europe, he believes, will be suppliers that are farthest away from Europe, have been established for 10 years or more and already know how to trade in several markets—in other words, U.S. companies. "The irony is that, of course, in America they've never really distinguished between individual countries. Americans have been thinking about Europe as a single market for a long time," he says.

Software and Services Shine

All is not gloom and doom for native European suppliers. They do enjoy an advantage in one critical arena: software and services. U.S.-based suppliers have little presence in the $20 billion European software and services market, which is expected to grow 20% by 1992. By then, European users will be spending 60% of their information technology dollars on software and only 40% on hardware, predicts Merrill Lynch & Co. Analysts at the New York City brokerage firm say the ratio today stands at 40% software, 60% hardware.

The largest independent software and services company in Europe now is Cap Gemini Sogeti of France. But its $1.1 billion in revenues still represent only 5% of the total European market, leaving plenty of room for growth by other EEC native suppliers.

The Ups and Downs in Europe

The companies that grew the most in 1989

	1989 RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	% INCREASE
1	8	Groupe Bull*	6,465.4	5,296.7	22.1%
2	64	Finsiel	662.5	545.4	21.5%

The companies that couldn't keep up in 1989

	1989 RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	% DECREASE
1	99	Norsk Data	358.1	450.2	(20.5)%
2	59	Amstrad	717.0	841.8	(14.8)%
3	19	Nixdorf	2,792.6	3,044.9	(8.3)%
4	69	Comparex	566.0	614.5	(7.9)%
5	28	Memorex	2,056.6	2,078.5	(1.1)%

* Growth partly due to merger or major acquisition
Revenue figures are in millions of dollars.

Companies that call Brussels, Milan, Paris and other Continental sites home also have something else going for them in software: UNIX. Europeans have embraced the AT&T operating system and just about every other open systems standard as a way of avoiding dominance by U.S. suppliers. Thus far, U.S. suppliers have mostly sold proprietary systems to European users.

San Jose-based market research firm Dataquest Inc. predicts UNIX-related sales of software and systems will account for 20% of all information technology spending in Europe by 1992—up from 10% today. "The UNIX growth rate within each [category of computer] is greater than the overall segment growth rate," observes Jane Doorly, a Dataquest analyst.

But UNIX carries its own price—one that shows on the bottom lines of companies selling UNIX-based systems. Because anyone can license the standard from AT&T, UNIX spawns competitive pricing. Because it's new, UNIX requires suppliers to invest huge sums of money in software development and on features that help their UNIX solutions stand out in the marketplace.

Bull expects profit margins on systems to drop as much as 15% as customers move to UNIX. "We are committed to standards, and that doesn't make an easy situation," says Didier Ruffat, president of Bull's international operations. His company, for example, sold 39% more UNIX-based systems in 1989 than in 1988 in West Germany, but revenues from those sales increased only 21%. "I don't expect a high growth rate [in revenues] for the next few years," Ruffat says.

What Hand Will the East Bloc Deal?

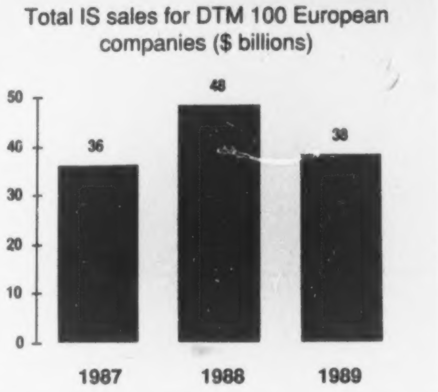
The wildest wildcard in Europe isn't UNIX, however; it's Eastern Europe. The advent of democracy in the East Bloc has sent the EEC scrambling for a proper response, and that response is to treat the largest new market in the world as a trading partner like any other. The East Bloc is expected to have a tremendous appetite for information technology as it hastens to establish a market economy and catch up with the West in everything from factory automation to telephone service.

"There is a great need for modernization of the infrastructure in these countries, and at the heart of this modernization is information technology," says Cliff Clarke, international trade policy manager for Digital. The world's No. 2 computer maker has just invested $2 million on a joint venture to sell computers in Hungary, with the realistic expectation that it may not pay dividends for some time. Most experts are of the belief that it will be five to 10 years before such ventures could hope to turn a profit. "We see enormous potential demand," Clarke explains, "and we are positioning ourselves for it now."

Information technology already gets some credit for the revolution in Eastern Europe. "Technology has made it possible," says U.S. Commerce Secretary Robert Mosbacher. "[Communist regimes] were transcended by people power, based by telefax and videotape."

Now the people of these nations want to get their hands on as much technology as they can. Eastern Europe is expected to spend $30 billion dollars on telecommunications equipment by the year 2000—not far below the United States. And that estimate may be conservative. West German Post Minister Chritian Schwarz-Schilling says $40 billion to $60 billion must be invested in East Germany's telecommunications system, with its 25- to 60-year-old public switches, to bring it up to West German standards. "This will remain the most serious problem for the next two years" in merging the two Germanys, he says.

Europe Holds its Own



The Soviet Union also has ambitious plans for its antiquated telecommunications system. Moscow officials want to increase the number of telephones in the country from 40 million today to 100 million by 2005. At the same time, they want to immerse Soviet society in computers—part of an ambitious program called "informatization."

The Soviets currently have 200,000 personal computers—one for every 1,500 citizens in a country whose population is 300 million people. The United States has about 38 million PCs—one for every seven of its 260 million people.

Most analysts see the East Bloc turning to Western European suppliers—not U.S. or Japanese companies—to help meet its computer needs. The reasons are many: partly because of proximity; partly because of the existing relationship between the regions; partly because U.S. companies are more reluctant to commit themselves to the long-term investments required of such trade; partly because of the problems of currency translation—but mostly because of CoCom.

Will Trade Restrictions Ease?

For 30 years, The Coordinating Committee for Multilateral Export Controls (CoCom)—whose members include the major economic powers except Japan and Australia—has been setting restrictions on technology exports to the East Bloc in order to prevent military equipment from reaching the Soviets. The end of the Cold War has brought calls for the end of technology restrictions from virtually all members of CoCom—except the United States. Although Washington is expected to agree to relax trade restrictions with Czechoslovakia, East Germany, Hungary, Poland and Romania, U.S. officials clearly state that the Soviet Union will still be off limits, to a large degree. "We are not going to turn around and just give the Soviet military the opportunity to catch up with us, " Mosbacher says.

The United States' hard-line attitude is forcing U.S. information technology suppliers to move slowly with regard to the East Bloc, giving Western European rivals a chance to capitalize on an already existing trade advantage. The East Bloc could overtake North America as the EEC's largest export market by the year 2000.

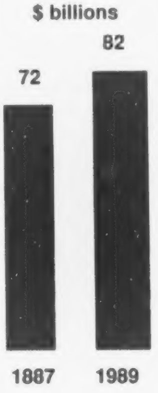
The East Bloc has a precious information technology resource to trade of its own—expertise in software development. Soviet and other East Bloc programmers are generally recognized as excellent, despite having to work with ancient technology tools. Witness the sophistication and success of Tetris, currently one of the best-selling computer games in the United States. Designed by Soviet programmer Alexey Pazhitnov, it's the first Russian computer game to enter the U.S. market. Russian-designed PC software packages include a time planner/project management program, a macroeconomics modeler, a database for TV schedules and a word-processing program similar to WordStar that includes a Russian-language thesaurus.

In addition to Digital's ventures in Hungary, there is some interest, albeit cautious, from U.S. information technology suppliers and retailers in the East Bloc. Computerland Corp. just opened the first computer store in Moscow, and various companies are setting up joint ventures to market products in the region. "We will be selling there in a significant way in a matter of years," promises Dean Morton, chief operating officer of Hewlett-Packard Co. He boasts that his Palo Alto company has had an office in the Soviet Union since 1969; the office now has 65 HP employees.

Trade experts are convinced this activity will increase, particularly because, as borders become free, trade barriers will become meaningless. "It's becoming very difficult to police CoCom," says Ambassador Bradley Holmes, director of the U.S. State Department's Bureau of International Communications and Information Policy. "But I'm sure you will continue to see substantial relaxation [of CoCom rules]. As technology changes, the process of review will change as well."

Change, indeed, is the watchword for users and suppliers of information technology in Europe. Trade and political barriers are disappearing. Native suppliers are consolidating. Technologies are shifting. Whether Europe's high and mighty—Bull, Cap Gemini, Olivetti, Siemens—can change fast enough with the times to keep their U.S. and Japanese competitors in check is a question that will be answered in the next few years. ▭

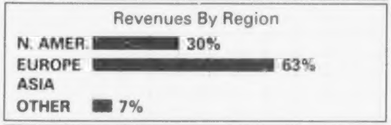
Catherine Barnat is a freelance writer based in London.



Europe spent $82 billion on IS in 1989, up 14% from 1987.

IS Revenues: $6.47 Billion

REGION 1 **GROUPE BULL** WORLD 8



GROUPE BULL SpA
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75116 Paris, France
(33-1)-45-02-90-90

Thanks to its takeover of Zenith Data Systems Corp. (ZDS), Groupe Bull SpA took another step toward greatness in 1989, overtaking Ing. C. Olivetti & Co. to become Europe's second largest computer company. But Bull also took a step backward into the red after four years of modest profits.

The acquisition of ZDS boosts Bull's revenues by some Fr8.5 billion ($1.3 billion), giving the company total revenues (on a projected, pro forma basis) of Fr41.3 billion ($6.5 billion) at the start of 1990. However, not taking ZDS into account, Bull's revenues increased by only a meager 4% to Fr32.7 billion ($5.1 billion). After posting net earnings of Fr303 million ($51 million) in 1988, the firm lost Fr267 million ($41.8 million) in 1989.

That figure accounts for Fr405 million ($63.5 million) in restructuring costs associated with plans to shrink Bull's French work force by 1,200 in 1990 from the present total of 18,500. Some 1,800 jobs were shed in France from 1988 to 1989, with an earlier 3,200 positions eliminated in the United States from 1987 to 1988.

Aside from adding revenues, the ZDS takeover has improved the distribution of Bull's revenue base. Bull has merged all its microcomputer activities with ZDS, and the enlarged company now generates 30% of its revenues in the United States (compared with a pretakeover 16%). Bull paid an agreed purchase price of almost $500 million for ZDS, but a subsequent reduction in estimates of the company's net worth led it to reclaim some $50 million from Zenith Electronics Corp., ZDS' parent company.

The capital of Compagnie des Machines Bull (CMB), Groupe Bull's parent company, was increased by a further Fr965 million ($151.3 million) in 1989, most of it contributed by the French government. The capital of Bull's U.S. subsidiary, Bull HN Information Systems Inc., was raised by $100 million, which was contributed by CMB and NEC Corp.

Bull's commitment to UNIX was rewarded early in 1989, when it became the first vendor to be certified by the X/Open Group for its SPIX operating system and DPX 2000 range of systems. Along with announcing new models and functionalities for its DPX 2000 series, Bull introduced a new UNIX system, the DPX/2, and the DPS 6000 series of departmental systems running both UNIX and GCOS 6. And Bull licensed Sunnyvale, Calif.-based MIPS Computer Systems Inc.'s reduced instruction set computing (RISC) technology for its high-end UNIX systems.

Bull also picked up some valuable contracts for its mainframes in 1989. Elf-Aquitaine in France added a second DPS 90 to its Grenoble site; the Michigan Department of Social Services ordered one DPS 90 system worth $20 million; and General Electric Co. signed a $53 million deal for five DPS 90s, nine DPS 9000s and five DPS 8000s.

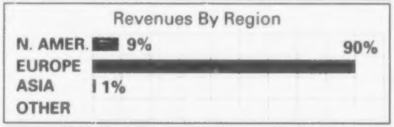
Whether Bull sustains greatness in the market depends on former managing director Francis Lorentz, now chairman and chief executive officer of the firm. He replaces Jacques Stern, the great architect of Bull's return from the brink of disaster between 1982 and 1989, who left in June 1989 to launch a supercomputer venture.

—*James Etheridge*

Groupe Bull's CEO Francis Lorentz talks strategy with Zenith's John Frank.

IS Revenues: $6.01 Billion

REGION 2 **SIEMENS** WORLD 9



SIEMENS AG
Wittelsbacherplatz 2
D-8000 Munich 2, West Germany
(49-89)-234-0000

Siemens AG shook up the industry in 1989 with its decision to snap up long-term local rival Nixdorf Computer AG. The acquisition was announced on the heels of a difficult year for Nixdorf, which reported a shart downturn in revenue growth, compounded by heavy losses in orders. The merger, however, will not be formally completed until this fall.

The new Siemens-Nixdorf Informationssysteme AG concern will have DM16.6 billion ($8.8 billion) in IS revenues. With 51% ownership, Siemens will gain the foothold it needs to build up its market presence throughout Europe—especially in France, Spain and the United Kingdom. By acquiring Nixdorf's customer base, Siemens will gain more retailers and banks. Nixdorf, in turn, may benefit from Siemens' strengths in computer-aided design and manufacturing (CAD/CAM), not to mention its financial reserves.

Siemens reported total revenues for 1989 of DM61.1 billion ($32.5 billion). The Communications and Information Systems division, which consists of three groups—Data and Information Systems, Private Communications Systems and Peripherals and Terminals—reported moderate growth of about 3% due in part to the success of Siemens' newly expanded BS2000 product line.

In telecommunications, Siemens struck out into new territory by purchasing Santa Clara-based Rolm Systems from IBM. Rolm Systems handles manufacturing and development, while a joint venture between Siemens and IBM, ROLM Co. of Norwalk, Conn., handles sales and services.

Several factors caused Nixdorf's weak performance in 1989. Publicly, Nixdorf's chief executive, Horst Nasko, blames negative press for the company's drop in revenues to DM5.25 billion ($2.8 billion) and its 15% decline in orders. Privately, he says decentralized planning was the cause of the shortfall. Nasko, who has been head of the company since Klaus Luft resigned in November, also acknowledges that Nixdorf's overdue switch from its proprietary systems to standard solutions took "an appreciable toll in terms of time and expense."

Despite the firm's difficulties, Nixdorf's telecommunications business flourished last year. Revenues in that sector increased some 35% to DM250 million ($132 million) in 1989. Nixdorf also celebrated the success of its Integrated Services Digital Network (ISDN)-capable terminals. And the company made a massive effort to underline its competence as a systems integrator for its traditional customer base. Nixdorf upgraded its UNIX-based Targon computers as well as introducing several new applications, PCs made to run on MS-DOS and UNIX and a new line of self-service equipment.

Siemens-Nixdorf will also implement a program set up at the end of 1989 by Nixdorf—independent of the merger—to significantly improve profitability in 1990. The plan includes reducing unprofitable activities such as CAD/CAM, decreasing personnel and increasing the firm's concentration on software and services.

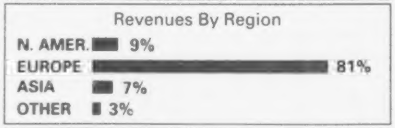
While Nixdorf merely planned a restructure in 1989, Siemens transformed its overgrown bureaucracies into 15 lean business units. Siemens' chief executive Karlheinz Kaske says these units give the company "new flexibility to react quickly to rash changes in the industry as well as the trend toward global markets." The reorganization apparently enabled the company to launch an aggressive joint acquisition with London's General Electric Co. of U.K. defense contractor Plessey Co. PLC. The maneuver will give Siemens control of Plessey's communications divisions in a joint venture known as GEC Plessey Telecommunications Holdings Ltd.

—Peggy Trautman

IS Revenues: $5.57 Billion

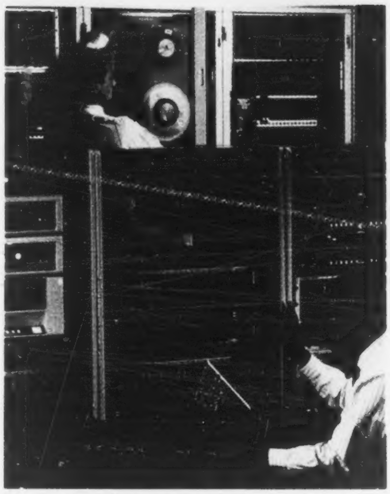
REGION		WORLD
3	**OLIVETTI**	10

Revenues By Region



ING. C. OLIVETTI & CO. SPA
Via G. Jervis, 77
10015 Ivrea, Italy
(39-125)-525

After two years of diminishing profits, Olivetti suffered another sharp drop in earnings in the 1989 calendar year: profits plunged 43% to L202.8 billion ($147.8 million). The problem



Siemens takes an aggressive stand on the information systems industry.

wasn't sales. Total group revenues rose 7.4% to L9.03 trillion ($6.6 billion), while IS revenues in particular advanced by 8.2% to L7.65 trillion ($5.6 billion).

A dismal showing in 1988, when profits were down 11.4%, led the group to undertake a major 1989 restructuring. It reorganized into four divisions—Olivetti Systems and Networks, Olivetti Office, Olivetti Information Services and Olivetti Technologies Group. Earnings were already 40% down in the first half of 1989, which chairman Carlo de Benedetti attributed to the cost of that restructuring.

But earnings took a further beating in 1989 because of fierce competition in Olivetti's main sector of activity, micros. Micro sales were up 10% to L2.1 trillion, ($1.5 billion), accounting for 27% of IS revenues, nearly the same as 1988. Mainframe sales fell 13% to L145 billion ($105 million) in 1989, slipping to less than 2% of total IS sales.

In October 1989, Olivetti became the first major vendor to introduce a PC based on Intel Corp.'s i486 chip when it announced the CP486 computing platform for its new generation of micros. For its PCs, the company is committed to the Extended Industry Standard Architecture (EISA), although it has not abandoned IBM's Micro Channel Architecture (MCA).

The new platform might help Olivetti improve its lackluster performance in the European micro market, where in terms of unit value it lost its No. 2 position to Compaq Computer Corp. in 1988. Olivetti's market share plunged from 13 to 7.6% between 1985 and 1988, while Compaq's rose to 9.5%.

Olivetti remains particularly strong in banking systems, and in 1989 a bank awarded the company the largest contract in Olivetti's history. The Dutch cooperative banking federation Rabobank, which comprises 900 banks and 2,200 offices in the Netherlands, placed an order worth L500 billion ($364 million) for a complete banking system including 2,000 LSX minis (running under Olivetti's version of UNIX, X/OS) and 25,000 PB workstations (first running MS-DOS and, later, OS/2). The system will be based around Olivetti's Open Systems Architecture (OSA).

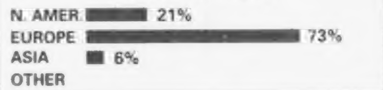
Although its five-year alliance with AT&T ended in 1989, Olivetti continued cooperating with other vendors throughout the year. A technology exchange deal with Digital Equipment Corp., allowing Olivetti PCs to be integrated into Digital networks, was followed in April by an agreement allowing Digital to market Olivetti PCs in Europe.

—James Etheridge

IS Revenues: $2.81 Billion

REGION		WORLD
4	**NV PHILIPS**	18

Revenues By Region



NV PHILIPS GL
5621 BA Eindhoven
The Netherlands
(31-40)-79111

Although the information technology and communications business of NV Philips GL performed better than the company overall in 1989, slumping computer sales contributed to a disastrous start for the company in 1990. So bad, in fact, was Philips' first quarter performance this year—when earnings from core operations totaled only G6 million, down from G223 million in first three months of 1989—that two top executives are being forced to resign their positions at the company, effective next month.

Departing from Philips are Cornelius van der Klugt, president, and Gert Lorenz, who had headed up its computer business. Just weeks before Philips announced its first-quarter results, van der Klugt had been predicting an improvement in his company's profitability for 1990. Philips' management now believes it will be difficult to derive more income from existing operations in 1990 than the company did in 1989.

For 1989, total revenues for Philips edged up a meager 2% to G57.2 billion ($26.7 billion). Operating income fell 5.5% to G2.29 billion ($1.1 billion), but net income rose 30% to G1.37 million ($647.8 million). The company's information technology (IT) business posted better performance records than the firm's averages, boosting sales by 8% to G5.97 billion ($2.8 billion) in 1989, although the strengthened dollar gave Philips virtually flat sales when measured in U.S. currency.

Peripherals remained by far the largest single IT category for Philips, generating 33.7% of that sector's revenues, slightly more than in 1988. Microcomputers again recorded the fastest sales growth, soaring 44% to G940 million ($443 million). Minicomputer sales, in contrast, slumped nearly 15% to G750 million ($353 million). The contributions of data communications equipment and maintenance services were more or less stable at 16.2% and 14.1%, respectively.

Earnings from IT sales, however, were poor in 1989, and at the beginning of 1990 this business was reorganized into three separate divisions—information systems, communication systems and applications software—to enable each division to cater more specifically to its particular market.

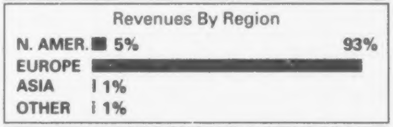
Building on its buoyant micro business, Philips was one of the first vendors to launch a PC based on Intel Corp.'s 33-megahertz 386 TM chip. Announced in May of 1989 and dubbed the P3370, the PC was shipped last fall. This high-end micro supports a variety of operating environments, with MS-DOS 4.0 as standard and OS/2, Presentation Manager, LAN Manager, Microsoft Windows and Novell NetWare optional. At the mini level, Philips extended its P9000 UNIX-based family with a high-end P9600, which has four times the power of the previous high-end model and is designed to handle up to 150 workstations.

In office automation applications, Philips launched a new low-cost optical storage system and its first case-handling application during 1989. The Megadoc family of optical-filing systems was enlarged with the entry level Megadoc-10. Designed for low-volume document storage and retrieval in small working groups within banks, insurance companies and government, it has a capacity of 16,000 pages per disk. Philips' new Documan application electronically creates, stores, routes, monitors and controls access to case folders. Philips is also the main contractor for a European Community project that is developing a case-handling system for the insurance industry.

—James Etheridge

IS Revenues: $2.79 Billion

REGION **5** **NIXDORF** WORLD **19**



NIXDORF COMPUTER AG

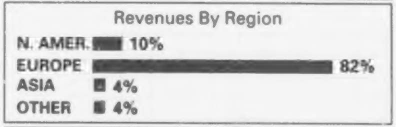
Furstenallee 7
D-4790 Paderborn, West Germany
(49)-525-1150

Nixdorf Computer AG may be enjoying its last year as a separately listed company in the DATAMATION 100. If all goes according to plan, Nixdorf soon will be a part of Siemens AG—the result of a merger proposed last year, one in which Nixdorf struggled.

Nixdorf's information systems revenues in 1989 fell nearly 2% to DM5.25 billion ($2.8 billion). For details on what happened to West Germany's No. 2 computer maker, please see our profile on Siemens.

IS Revenues: $2.64 Billion

REGION **6** **STC** WORLD **22**



STC PLC

1B Portland Place
London W1N 3AA, U.K.
(44-01) 323-1000

When STC posted profits in 1989 of £278.2 million ($456.7 million), 10% higher than expected, it should have been welcome news. But it wasn't. Instead, the company's shares dropped slightly in London, where analysts credited the higher figure to the company taking a pension fund holiday, which contributed £36 million ($59 million) to the profit account.

But the initial reaction may have been hasty. STC chairman Arthur Walsh chose not to give the windfall to shareholders; instead, he pumped that money, along with a lot more, into research and development. The R&D budget rose nearly a third £271 million ($443.2 million), with particular emphasis on optical communications and computing.

Among STC's IT divisions, operating profits rose handsomely for the communications operations (26%) and for the components and distribution division (52%). For the eighth consecutive year, operating profits rose at International Computers Ltd. (ICL), STC's information systems subsidiary. ICL rated third of STC's IT divisions, with a 13% increase in profits to £145.7 million ($238.3 million), on revenues of £1.6 billion ($2.6 billion, up 18%), with more than 60% of sales coming from the United Kingdom. The increase, however, was no mean feat these days, particularly as increases in inflation and interest rates in the United Kingdom have squeezed the margins of hardware products.

Still, many questions remain over ICL's future, as STC continues to look for potential partners. The parent company wants to help share research costs at ICL, whose appeal was certainly enhanced with the $168 million acquisition of California-based Computer Consoles (now ICL North America).

Internally, ICL moved to hold down product costs by reducing its manufacturing and logistics operations in the United Kingdom from four sites to three. And in March 1990, ICL reshuffled its Mainframe, Office, Network and Software Services Units into three new divisions: Computer Products, IT Services and Systems Integration. The company says the shift signals its move from a "box supplier" to a "total solution provider."

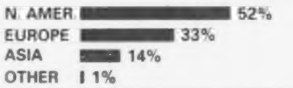
Some 1989 investments enhance that ability. ICL Germany took a 40% share holding in Metatech, a software house specializing in applications for the manufacturing sector. In the Netherlands, ICL established SIAC, a systems and software house with 80 employees. ICL is operating in six Eastern European countries, including two joint ventures—one in the U.S.S.R. for assembling PCs and another in Poland for the local assembly of ME29 mainframes.

In January, ICL introduced its DRS 6000 series, a new range of high-powered, midrange, UNIX-based systems, making ICL the first major international supplier to combine Scaleable Processor Architecture (SPARC)-based reduced instruction set computing (RISC) with the latest version of the UNIX System V.4 operating system. Even before the upgrade, the DRS series won some significant business in 1989, notably from the Spanish Ministry for Social Security and from the Portuguese government. Also this year, ICL plans to introduce its most powerful Essex series mainframes, aimed at large users such as central governments and utilities. *—Tim Harper*

IS Revenues: $2.06 Billion

REGION 7 | **MEMOREX TELEX** | WORLD 28

Revenues By Region



MEMOREX TELEX NV
Hoogoorddreef 9
1101BA
Amsterdam ZO
The Netherlands
(31-20) 974-331

With the 1988 merger of Memorex International of Amsterdam and Telex Corp. of Tulsa, Okla., well behind it, Memorex Telex NV began to look out at the world again in 1989. Although the company shipped 11 new products in 1988, last year brought an even stronger emphasis on the company's storage and networking market strategies. Specifically, in 1989 the firm brought out a series of new items, including a large capacity disk drive with a small footprint. IS revenues for calendar 1989 totaled $2.05 billion.

Memorex says the two halves of its company have complementary product sets and a geographical spread that is beginning to show through. The merger created a company large enough to demand a global presence and acquire the resources needed to develop commercially successful new products. On the one hand, Memorex International earned 70% of its sales in Europe and only 30% in the United States. For Telex Corp., on the other hand, the U.S. accounted for 85% of sales. The merged range of products fits well together, as Telex adds vital networking products to Memorex's emphasis on peripherals for large IBM machines.

The AS/400 peripherals market segment is expected to be strategic for the company, which released several products there in 1989. The company hopes to capture 30% of the market within three years. New product introductions include the 5460 cartridge reader, which holds up to 10 cartridges (compared with IBM's 3490, which holds eight). The unit works with both AS/400 and System/38 machines, which makes it useful for sites planning staggered upgrades or those running applications on both systems.

In October, the company started shipping its new IBM 3380-compatible 3890 disk drives and its robotics-based automated tape library.

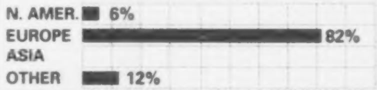
Another important 1989 product release was the 1174 series of remote controllers, which can hook up to four host machines and 96 coax devices. Manufactured at Memorex Telex's factory in Raleigh, N.C., the controllers should be "of key importance to our customers' networking strategies," says the company spokesman.

Memorex Telex made some strides in 1989 as a supplier of software for value-added networks. One such order was to supply workstations, software and service for Galileo, the air travel reservation system being developed by a consortium of European airlines including British Airways and KLM. Galileo promises to be one of Europe's largest value-added network applications. *—Paul Gannon*

IS Revenues: $1.80 Billion

REGION 8 | **ALCATEL** | WORLD 32

Revenues By Region



ALCATEL NV
33 Rue Emeriau
75015 Paris, France
(33-1)-40-58-58-58

The enlarged, but more specialized Alcatel NV, created from the merger of the information technology and telecommunications activities of France's Compagnie Générale d'Electricité (CGE) and ITT Corp.'s worldwide telecommunications interests, completed its first three years of operation at the end of 1989 on a buoyant note.

After a slight decline in revenues in 1988, Alcatel achieved a 15% increase in 1989 to European Currency Unit 12.8 billion ($14.1 billion), and net income jumped 43% to ECU478 million ($526 million). (Alcatel is registered as a Dutch company and uses the European Currency Unit for accounting purposes.) Net margins thus rose from 3.2 to 4.1% in 1988. Margins improved despite restructuring costs of ECU223.5 million ($246 million), a sharp increase, practically as much as the costs for the previous two years combined. More than 80% of Alcatel's 1989 revenues came from Europe, with over 28% coming from France alone. North America chipped in 5.8%, and the rest of the world contributed 12.5% of revenues.

The company's four main operating divisions were partially reorganized at the end of 1989, the principal move being to broaden the Transmission Systems Division (which generated 14% of sales in 1989) to form the Radiocommunications, Space and Defense Group.

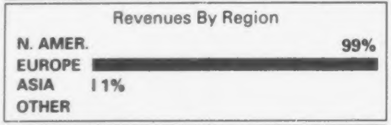
As for the other three units, the Network Systems Group contributed 25% of sales in 1989, Business Systems accounted for 21% and Cables, 28%. The remaining 12% of 1989 sales came from professional electronics and other activities.

Alcatel's strategy is to offer complete network and systems solutions encompassing voice, data, text and image. To that end, it pursues technical alliances that widen its markets and reinforce its product line. In 1989, the firm's French telephone equipment and business systems subsidiary, Télic Alcatel, and IBM France agreed to develop a service and communications bridge between their respective equipment. Alcatel and Siemens AG also announced common specifications for inter-PABX (private automatic branch exchange) signalling in private Integrated Services Digital Networks (ISDNs).

Alcatel secured the rights to manufacture and distribute the high-speed local area network (LAN) switches and software of QPSX Communications of Perth, Australia. Télic Alcatel also signed a 10-year agreement with the Cairo-based Egyptian Telephone Corp., providing for ETC to manufacture the Alcatel 2600 PABX. *—James Etheridge*

IS Revenues: $1.19 Billion

REGION **9** — **NOKIA** — WORLD **46**



NOKIA DATA AB

P.O. Box 226
SF-00101
Helsinki, Finland
(358-0) 180-71

Nokia, the highly aggressive Finnish conglomerate, once again has failed to present convincing evidence that its efforts in the computer business will be ultimately successful. Sales of the data division in 1989 totaled 5.1 billion Finnish markka (about $1.2 billion), up only 5% over 1988, but the division managed to break even, at least according to management.

When Nokia acquired and merged the Data Division of the Swedish telecommunications giant LM Ericsson Telephone Co. in January 1988, with its own data operations, observers were skeptical. Ericsson had struggled for several years to try to make the division profitable, but had failed completely.

Nokia, however, has managed to halt the bleeding, creating a data division with a strong position on the Scandinavian market, particularly in banking and insurance. Nokia Data concentrates on packaged solutions of both hardware and software, which are of its own development and manufacture. Its strategy is similar to that of other small makers: open systems, systems integration and a solutions orientation.

Compared internationally, Nokia is a small hardware producer. In fact, in producing minicomputers, PCs and terminals, the firm is more an assembler than a manufacturer. But management insists that being large is not necessarily an advantage. In Scandinavia, for instance, Nokia's IBM-compatible PCs sell well, due mainly to excellent ergonomics.

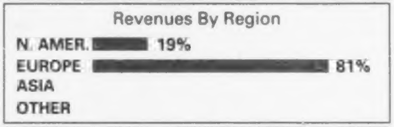
To sell its technology, Nokia divides its business geographically: Finland, Scandinavia and the rest of Europe. The home market, Finland, accounts for 40% of sales. Nokia Data also is an agent for other companies' products in Finland, including Hitachi Ltd. mainframes. Market shares are very high; Nokia is Finland's great hope in high tech, and national chauvinism helps maintain strong sales. Even in Scandinavia, which accounts for 30% of sales, Nokia has a relatively large market share. In Sweden, Nokia is the second-largest hardware supplier after IBM. The picture is completely different in the rest of Europe, where Nokia Data has small market shares and poor profitability.

Nokia Data could be an ideal partner or acquisition candidate for an international computer company that wants to strengthen its market position in Scandinavia. There have been unconfirmed reports that Olivetti is negotiating to acquire Nokia or will work out some kind of cooperative agreement. These rumors started when Olivetti's former vice president, Vittorio Levi, was named managing director of Nokia Data, to succeed Kalle Isokallio as of January 1, 1991.

—*Johan Hallsenius*

IS Revenues: $1.10 Billion

REGION **10** — **CAP GEMINI** — WORLD **48**



CAP GEMINI SOGETI

11 Rue de Tilsit
75017 Paris, France
(33-1)-47-54-50-00

Except for absorbing five small firms specializing in information systems in 1989, Cap Gemini Sogeti concentrated on consolidating and streamlining its organization last year, significantly improving its profitability. The breather was necessary for the group to complete its merger with SESA, the French service company it took control of in late 1987.

As a result, group revenues increased by 21.2% to Fr7.04 billion ($1.1 billion), up from Fr5.8 billion ($976 million) in 1988, while net earnings surged by over 30% to Fr525 million ($82.3 million), up from Fr402 million ($67.5 million). Net margins thus jumped to a record 7.4% from an already healthy 6.9% in 1988. At the same time, the company raised additional funding of Fr1.5 billion ($235.1 million) through an issue of 10-year convertible bonds.

France again accounted for 46% of Cap Gemini's revenues, while other European countries contributed 34% (down from 38% in 1988). The United States chipped in with 19%, up slightly, mainly because of the stronger dollar and some U.S. acquisitions. The company's four main sectors of activity—industry, finance and banking, distribution and services, and telecommunications—each generated at least 20% of revenues, while government (including defense) accounted for around 15%.

Of the five small IS firms absorbed in 1989, two are in the United States: Systemation Inc. of Cleveland, which is strong in systems integration, and Merit Systems Inc., a Detroit service company specializing in industrial IS. The takeovers added annual revenues of $40 million, boosting Cap Gemini America's revenues to $230 million in 1989. In Europe, Cap Gemini acquired a small Swedish firm, Accept Data, based in Stockholm, which develops financial systems, and two French firms, Apsis and Aptor, both based near Grenoble, specializing in industrial systems.

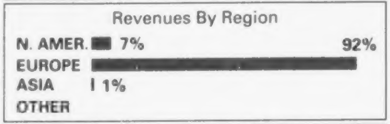
Within the company's existing organization, its Italian subsidiaries had a particularly good year in 1989. Milan-based Cap Gemini Geda picked up contracts from the new Milan airport; the Italian national railway, Ferrovie dello Stato; and from the city of Rome for a town-planning database and management system. Rome-based SESA Italia (now Cap Gemini Italia) was awarded a systems integration contract for the European space shuttle project Hermes. Elsewhere in Europe, the Royal Dutch Navy retained Cap Gemini to develop a complete stock control and procurement system, while a Swedish hydroelectric power consortium contracted Cap Gemini's Swedish subsidiary, Cap Gemini Logic, to develop a system for power distribution management.

In preparation for the unified European market, Cap Gemini Logic and Cap Gemini Pandata, the firm's Dutch operation, were reorganized in 1989 by merging several subsidiaries into single vertically structured units in each country. In February 1990, Cap Gemini also established an international support group in Paris.

Finally, responding to the demands of its customers, Cap Gemini has begun to diversify into more general corporate consulting with the acquisition in January 1990 of a 67.5% holding in Gamma International, a Paris-based management consulting firm. —*James Etheridge*

IS Revenues: $819.1 Million

REGION 11 **MANNESMANN** WORLD 54



MANNESMANN KIENZLE GMBH
Postfach 16 40 7730 VS-Villigen
West Germany
(49-7721)-671

1989 is the year Mannesmann Kienzle GmbH stopped merely supporting standards-based systems and started to push them. At least that's what one company spokesman says. The goal was a smooth transition between Mannesmann's proprietary operating systems, MTOS and UNIX. The means was its first UNIX-based business system series, the 2000, which formed a bridge between the company's 9000 family and "the world of UNIX."

To focus attention on its new solution, the company increased promotion of its Kienzle Integrated Digital Area Network (KIDAN), a local area network (LAN) that enables communication between the 9000 and 2000, as well as other systems. Mannesmann also introduced 15 new application software packages for the building, trade and service industries last year.

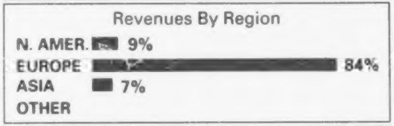
Revenues totaled DM1.86 billion ($986 million) for calendar 1989. Following the restructuring that split the group into independent business divisions, Kienzle Computer Systems reported a 5.8% rise in revenue, Mannesmann Tally (printers) reported a 13.8% increase and PCS Computer Systems reported a jump of 19.3%. DATAMATION estimates Mannesmann's total IS sales in calendar 1989 to be DM1.5 billion ($818.6 million), a rise of 12% over 1988's figures.

In telecommunications, Mannesmann turned its attention to the Integrated Services Digital Network (ISDN) and to finding ways to combine computers with telephones. To that end, the company teamed up with Siemens AG in a venture called PBX and Computer Teaming (PaCT). PaCT's first task was connecting Mannesmann terminals to computers using Siemens' Hicom private branch exchanges (PBXs)—a first step toward what Mannesmann calls computer-aided telephoning. To complement last year's developments, the company introduced a new line of fax machines that are compatible with the standards of the Consultative Committee on International Telephone and Telegraph (CCITT).

Mannesmann ended 1989 with an accent on mobile communications, winning the West German Post Ministry license for the country's second pan-European digital cellular communications network. Mannesmann's Dusseldorf-based subsidiary, Mannesmann Mobile Funk GmbH, heads the consortium, joined by partners Pacific Telesis International, based in San Francisco, and Cable and Wireless PLC in the United Kingdom. Mannesmann plans to install and market services by 1991. *—Peggy Trautman*

IS Revenues: $717 Million

REGION 12 **AMSTRAD** WORLD 59



AMSTRAD PLC
Brentwood House
169 King's Road
Brentwood, Essex CM14 4EF, U.K.
(44-277) 228-888

In many ways, 1989 was another dismal year for Amstrad PLC, with a continuation of the volume woes—sales too low, inventories too high—that always mean trouble for a marketing company. And Amstrad, whose business centers on PC clones, has always insisted that it is a marketing company, rather than a technology company or even a computer company.

But 1989 may be regarded as the year that Amstrad and its mercurial founder-chairman Alan Sugar, began to turn things around. After inventories climbed to £335 million ($548 million) and net borrowing rose to £114 million ($186 million) last autumn, Amstrad's shares slumped 82% on the London exchange. For the first time, Sugar admitted that Amstrad had made mistakes in virtually every aspect of its rapid expansion.

Several new executives came in to beef up the floundering senior management, led by a new group finance director, Peter Thoms. By early 1990, the company was in a cash neutral position, and inventories had been sliced to a more acceptable £220 million ($360 million), with a goal of £150 million ($245 million) by the end of the year. And despite months of suffering from rising British interest rates, Amstrad's results for the second half of 1989 showed pretax profits of £30 million ($49 million), almost doubling analysts' expectations.

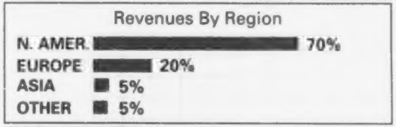
The company also brought new management into Spain, the United States and West Germany. One mistake, Sugar said, was that a lack of cost monitoring and controls in those countries (which are now in place, he says) led him to overemphasize revenue growth.

Sugar is pinning high hopes on a new venture with London-based STC PLC in Belfast, Northern Ireland, to produce a reliable, attractively priced telefax machine for the home and small office. The company formed two other major manufacturing alliances during 1989, one with Marconi for satellite equipment and another with GPT, part of GEC-Siemens, for its top-end 80386- and 80286-based PC 2000s. About 7,000 of those machines had to be recalled during 1989 because of hard disk problems. To improve product quality and service, Sugar's new managers will put more emphasis on research and development and will provide more direct support for end users.

Sixty percent of Amstrad's business is done abroad, but its efforts remain patchy. The company is well pleased with its subsidiaries' performances in Australia, Italy and West Germany, for instance, but has been disappointed in the United States and is expecting a continued slide in Spain. Eastern Europe is seen as a major potential market, led by a deal unveiled in early 1990 to sell 40,000 PCs to the Soviet Union. *—Tim Harper*

IS Revenues: $692.5 Million

REGION 13 **BRITISH TELECOM** WORLD 62



BRITISH TELECOMMUNICATIONS PLC
81 Newgate Street
London EC1A 7AJ, U.K.
(44-1)-356-5000

British Telecommunications PLC is not generally known for the spectacular, but in 1989, British Telecom of-

British Telecom has spanned the globe for acquisitions.

ficials began taking a brash approach, seizing every opportunity to demonstrate that it wants to become the world's most successful telecommunications company. Even amid the economic fluctuations and fears running through Britain in late 1989 and early 1990, its share prices rose, and British Telecom lost its reputation for being an undervalued stock.

The market may have perceived that the company is a bit closer to its stated goal due to a pair of major acquisitions made during 1989.

The company purchased Tymnet's network systems business and its associated applications from McDonnell Douglas Corp. for $355 million. BT's worldwide network systems and network applications business, which accounted for some £220 million ($360 million) in 1989 revenues, is now being run by the wholly owned British Telecom subsidiary BT Tymnet Inc. in San Jose. The second significant acquisition was a 20% stake in McCaw Cellular for $1.37 billion. McCaw's ownership or interest in 130-some cellular telephone operations throughout the United States gives British Telecom the opportunity to build its long-dreamed-of national cellular network in the United States.

In 1989, British Telecom also entered a joint venture with OTC Australia. The new company, Network Innovations PLC, will manage the OTC Dialcom public electronic mail service, as well as develop, market and support other value-added services in Australia.

At home, fierce competition from Mercury Communications Ltd., which is expanding its services from long-distance to pay phone calls, is a nagging issue. The increased competition has caused BT executives to be quite vocal in criticizing the U.K. government's regulatory policies. While BT applauds the ideals of those policies, which it calls the most open in the world, it complains that the regulations are hurting the company both domestically and abroad.

BT is also reviewing its position as a private branch exchange (PBX) manufacturer. In January 1990, British Telecom announced that it might sell all or part of its 51% shareholding in the Mitel Corp. The disclosure demonstrated that BT does not see PBX manufacturing as an essential part of its global network services strategy.

British Telecom's major growth markets will be in mobile communications and data communications, including two international paging operations: Metrocast, which is already operating in the United Kingdom and United States, and Euromessage, which was scheduled for a Spring 1990 launch in France, Italy, the United Kingdom and West Germany. And, although the company is saying little about it, analysts believe a key part of the 1990 strategy is to chase the 20% of TELEMEX being offered by the Mexican government.

Along with the business changes and expansions, British Telecom is hoping to improve its image of poor quality service by modernizing the phone system. Analysts believe one potential roadblock to accomplishing this is the high cost of giving its engineers pay raises of perhaps 10%. In March, 1990, the company announced a restructuring that could result in a loss of 10,000 employees over the next three years. *—Tim Harper*

IS Revenues: $662.5 Million

REGION		WORLD
14	FINSIEL	64

Revenues By Region

N. AMER.	4%
EUROPE	96%
ASIA	
OTHER	

FINSIEL SPA
Via Isonzo, 21/B
00198 Rome, Italy
(39-6)-851505

Finsiel SpA (Finanziaria per i Sistemi Informativi Elettronici), Europe's second-largest software company, is taking an active part in Euromethod, the European Community project aimed at defining standard software development methodologies. Finsiel is already a key player in this effort through the distribution of its Dafne methodology and various computer-aided software engineering (CASE) tools.

In 1989, Finsiel also looked beyond Europe. Through its research and development group, Tecsiel, Finsiel has taken another step toward standardization by cooperating with groups espousing standards, such as X/Open Co. Ltd. Tecsiel has also signed agreements with Fort Lee, N.J.-based On-Line Software International Inc. and France's TITN-Alcatel to encourage the global distribution of its software packages. Finsiel also signed an agreement with the U.S.S.R. State Committee for Computers and Information Sciences for joint development of application and systems software.

Finsiel's 1989 revenues rose 28% to L908.7 billion ($662.5 million). To boost Finsiel's future prospects, the state-owned Instituto Riconstruzione Industriale, Finsiel's major investor, increased its investment in the company, boosting capital to L52 billion ($38 million). *—Simone Gozzano*

IS Revenues: $573.9 Million

REGION		WORLD
15	RACAL	68

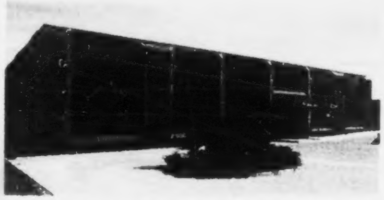
Revenues By Region

N. AMER.	40%
EUROPE	45%
ASIA	10%
OTHER	5%

RACAL ELECTRONICS PLC
Western Road
Bracknell, Berkshire
RG12 1RG, U.K.
(44-344) 481-222

In 1989, Racal focused on expanding its technology base and continued its steady move away from hardware production into systems, managed networks and network services—a strategy the company plans to pursue at least for the next several years. Sales of Racal data communications products rose 12.7% in 1989 to £350.9 million ($574 million).

Last year, British Prime Minister Margaret Thatcher inaugurated the Government Data Network, a Racal-managed service for the U.K. government, which was the centerpiece of a 10-year, $510 million contract Racal won in 1988. As part of a follow-on to that network, Racal



At Racal in Hampshire England the focus has moved to systems.

Data Networks Ltd., a subsidiary of the Racal Data Communications Group, is in discussions with the U.K. government for an integrated voice and data service. Another 1988 contract, for a managed voice service for the U.K. Department of Social Services, went live in September 1989. And a new contract for the Data Communications Group went to Sunrise, Fla.-based network systems supplier Racal-Milgo for the communications infrastructure of the Channel Tunnel project.

For these and other projects, the technologies that will drive the company in the 1990s include high bandwidth local area networks, internetworking, high bandwidth circuit and packet switching, open systems standards, full-service network management, voice-data integration and Integrated Services Digital Networks (ISDN). Racal's ability to expand into these technology markets was bolstered last year by a trio of acquisitions: the DCA Network Communications Group (being merged with Racal-Milgo), specializing in T1 digital communications and OSI network management; Quanta Communications Systems Inc. (now trading as Racal Quanta), a fiber optics communications company; and Interlan Inc. (now trading as Racal Interlan), a leading U.S. local area network company.

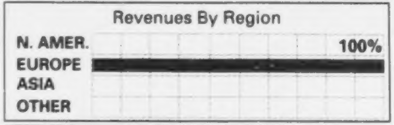
The United States remains Racal's biggest source of revenue, but Europe is the fastest growing market. Racal's home market, the United Kingdom, accounts for 23% of its total worldwide sales.

Among the moves designed to improve its internal organization, Racal consolidated all its U.S. manufacturing, including that of Racal-Milgo and its Racal-Vadic modem maker, at a single site in Miami.

Racal believes the factors most critical to its future success include first-class distribution channels, product cost reductions, innovation and effective network services. —*Tim Harper*

IS Revenues: $566 Million

REGION		WORLD
16	COMPAREX	69



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A decrease in the demand for compatible mainframes resulted in continued price decreases. This, compounded by problems in disk storage system deliv-

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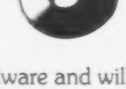

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eries, kept Comparex Informationssysteme GmbH's revenues for 1989 down to DM1.06 billion ($566 million)—about 1.5% below the previous year's figures.

Speculation concerning the Hitachi Ltd. takeover of National Advanced Systems Corp.—a major competitor of Comparex in Europe—fueled speculation about how that acquisition would affect products Hitachi supplied to Comparex in Europe. That speculation had a negative effect on Comparex's sales.

However, chairman of the board Rolf Brillinger calls the firm's 3% earnings on revenue satisfactory, adding that such figures show that Comparex "is thoroughly sound and has proved it can hold its position even against extremely tough competition."

Comparex West Germany contributed the most to total corporate revenues with DM482 million ($256 million), although its growth remained static. Other European subsidiaries reported increases in their market shares, with Belgium, France, the Netherlands, Spain and Switzerland all recording double-digit growth. The firm's work force rose 2% in 1989 to 1,145 employees worldwide, as a result of increased sales by the subsidiaries. Sales to partnership companies, however, decreased by 15% in 1989 to DM153 million ($81 million), due to a limited availability of Comparex's products.

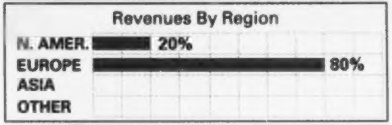
Over half of Comparex's sales are peripherals. Comparex's 3090-class mainframes accounted for 32% of domestic revenues, and services chipped in 16%.

Particularly high demand for disk storage systems and a holdup of their delivery from Hitachi produced a backlog of orders that couldn't be completely made up in the second half of the year. However, despite these setbacks, Brillinger says he expects sales of 3090-class CPUs, peripherals and service products to increase in the 1990s. Sales for those goods, he says, will get a shot in the arm from increased trade with Eastern Europe and an eventual change in the rules set by the Coordinating Committee for Multilateral Export Controls (CoCom).

—Peggy Trautman

IS Revenues: $431.5 Million

REGION		WORLD
17	SD-SCICON	83



SD-SCICON PLC
Centrum House
101-103 Fleet Road
Fleet, Hampshire GU13 8NZ U.K.
(44-252)-622-161

SD-Scicon, born out of the 1988 merger of two British software houses, Systems Designers and Scicon International, focused in 1989 on assimilating the two companies and defining the principal markets for the new, combined company. In that first full year of operation, SD-Scicon realized IS revenues of £263.8 million ($431.5 million), up 28% over 1988. The combined company was inaugurated formally in January 1990,

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DATAMATION 100

with Philip Swinstead as chairman and Ian Scoggins and Geoff Holmes as joint chief executive officers.

SD-Scicon has decided to concentrate on Europe. It will not pull out of the United States completely; its vehicle-emission testing programs are used by many states. However, the company sees itself as a niche player and says its resources are not suited to a market as vast and competitive as the United States. But Europe seems more manageable and, with the democratization of Eastern Europe and the prospect of fewer trade barriers in 1993, appears to offer much more growth potential.

One result of the decision to stay close to home was SD-Scicon's early 1990 sale of Warrington Financial Services, a U.S. on-line bond-trading consulting company, to another U.S. firm, Sungard Data Systems Inc. of Wayne, Pa. The $65.3 million Warrington sale provided £24 million ($39 million) in after-tax capital that can be used to finance further expansion in Europe. Part of that expansion may be some sort of alliance with Sligos of France; SD-Scicon will say only that the two companies are in wide-ranging discussions.

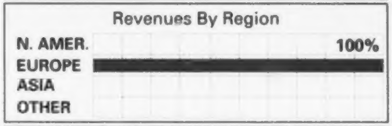
Internally, one of the most notable aspects of SD-Scicon is the company's commitment, from the chairman's office on down, to a "total quality management" program. While many companies dabble in these programs, SD-Scicon's top people seem determined to make it stick over however many years it takes to build an infrastructure of quality-oriented management geared toward making the right decisions the first time.

In Europe, SD-Scicon sees the 1993 drive toward harmonization as opportunities for that new business, both for its technical products and professional services. In products, expected growth areas include facilities management, particularly in plant maintenance and manufacturing applications, and in communications, particularly the X.400 market. In professional services, the company sees itself becoming more in demand for both systems integration and turnkey projects.

—Tim Harper

IS Revenues: $400.7 Million

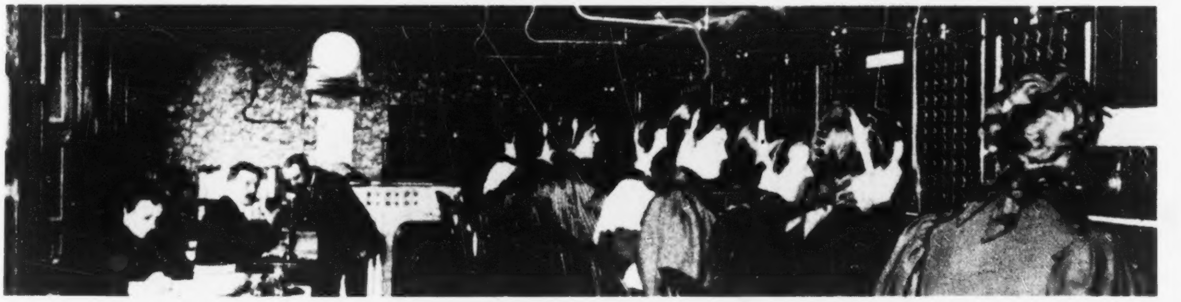
REGION		WORLD
18	**SLIGOS**	**89**



SLIGOS
3 Place de la Pyramide
Cedex 49
92067 Paris La Defense, France
(33-1)-49-00-90-00

Sligos, France's second largest computer services company, enters the DATAMATION 100 after another year of healthy revenue and earnings growth. It did not have far to go, since in 1988 it was in 101st place worldwide, after recording a 46.2% jump in revenue (mainly due to acquisitions) to top the Fr2 billion ($343 million) mark. Revenue advanced a further 25% in calendar 1989 to about Fr2.6 billion ($401 million), while after-

Are You Communicating On A Party Line?



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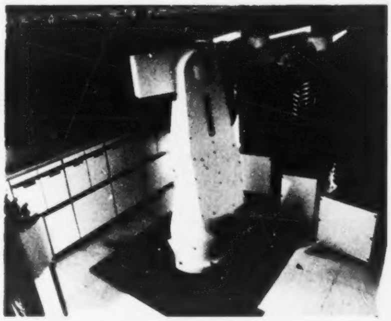
tax earnings were up about 36% to Fr134 million ($21 million). Net margins were thus restored to 5.3% following a dip to 4.85% in 1988.

Although Sligos has been a publicly quoted company since 1986, it is controlled by one of France's big four banks, Crédit Lyonnais, which retains a 62.8% holding in the company. That partly explains the importance of the financial sector in Sligos' total business: banking systems, electronic payment processing and ancillary services account for 36% of revenues. However, systems engineering, including industrial systems, remains the biggest activity, generating 46% of revenues (27% from large systems and 19% from microcomputers). The remainder comes from customized software packages for small and medium-sized companies (10%) and value-added services (8%).



Comparex's automotive cartridge library can handle 21,000 cartridges.

For all of its strength in banking and electronic payments, Sligos had no direct presence in West Germany up until its acquisition in 1989 of a 70% holding in Stuttgart-based Actis, which specializes in banking systems and electronic data interchange (especially for the automobile industry) and had revenues of DM27 million ($14.4 million) in 1989.

With the takeover of Actis, the proportion of Sligos' revenues derived from outside France has more than doubled, to around 9%. The company also owns the Spanish company Poli-Rub, based in Barcelona; has a 60% stake in Cortram Systems Ltd. of Valhalla, N.Y.; and a 70% stake in subsidiary Sligos Côte d'Ivoire, based in Abidjan, Ivory Coast.

By 1993, when it expects 15 to 20% of its revenues to come from outside France, Sligos hopes to double its revenues to Fr5 billion (about $785 million). To help it expand its operations elsewhere in Europe, the firm has entered into an informal alliance with the U.K.'s biggest service company, SD-Scicon PLC. No shares have changed hands, but the two are exploring avenues that would enable both to cater more effectively to the European market. *—James Etheridge*

IS Revenues: $378.6 Million

REGION		WORLD
19	SEMA GROUP	95

Revenues By Region

N. AMER.	
EUROPE	100%
ASIA	
OTHER	

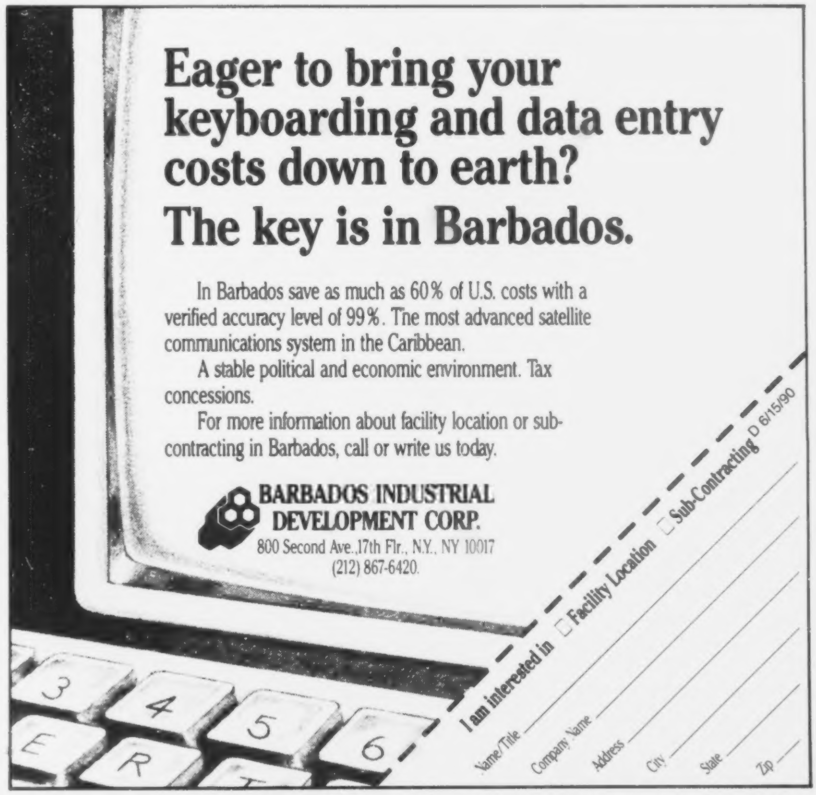
SEMA GROUP PLC
22 Long Acre
London WC2E 9LY, U.K.
(44-1)-379-4711

At the end of his first year at the helm of this Anglo-French software and services company, managing director Pierre Bonelli was able to announce a 35.7% jump in pretax earnings to £17.5 million ($28.6 million) on a 9.8% increase in revenues to £293 million ($479 million). Sema Group PLC's 1989 information systems revenues in particular were up 8.4% to £228.5 million ($374 million).

As in 1988, almost 90% of Sema's IS revenue last year came from systems engineering and integration, with the rest coming from facilities management. The market breakdown was also unchanged from the year before: banking and finance generated 24%; manufacturing 21%; defense and aerospace 15%; nonfinancial services 10%; energy, transportation and government 8% each; and telecommunications 6%.

France again accounted for 41% of the company's revenues, while the British share fell to 37% from 40% in 1988. A further 8% came from Spain, 6% from Belgium, 5% from the rest of Europe (essentially West Germany and the Netherlands) and 3% from the rest of the world (North America and Singapore).

Bonelli restored margins at both the



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U.S. and Dutch operations by reorganizing senior management, setting more realistic revenue targets and instituting tighter financial control and reporting systems. He also achieved his goal of expanding the company's activities in West Germany in December of 1989, when Sema acquired a 50% holding in a leading German software company, ADV/Orga F.A. Meyer AG of Wilhelmshaven. ADV/Orga lost a hefty DM14.2 million ($7.5 million) on sales of DM80 million ($42.5 million) in the year ended June 30, 1989, but Sema has trimmed the firm's work force from 600 to 500, and the scaled-down operation is expected to generate revenues of DM60 million ($32 million) in 1990.

Further European expansion occurred in January 1990 when Sema's new Swiss subsidiary started operating in Geneva. The following month, Sema acquired a 49% stake in a French financial systems company, Tibet, and took over German market research Emnid GmbH.

The largest slice of new business for Sema in 1989 was a $65 million contract for the design and supply of command and control systems for the Royal Navy. The company also signed a licensing agreement with Credit Card Software Inc. of Orlando, Fla., early in 1989 for the exclusive marketing rights to its Cardpac credit card processing system in Western Europe and the Far East.

—James Etheridge

IS Revenues: $358.1 Million

REGION		WORLD
20	**NORSK DATA**	99

Revenues By Region

N. AMER.	1%
EUROPE	99%
ASIA	
OTHER	

NORSK DATA AS
Olaf Helsetsvei 5
P.O. Box 25, Bogerud 0621
Oslo 6, Norway
(47-2)-62-60-00

Norsk Data AS, the Norwegian minicomputer maker, was widely acclaimed a few years ago as one of Scandinavia's greatest modern corporate successes. But no longer: 1989 was a year of extremely tough work and painful reorganization.

Norsk Data was hit by a financial crisis in 1988, which continued through calendar year 1989 when pretax losses climbed to 417 million kroner (about $61 million) from NKr323 million ($50 million) in 1988. At the same time, sales declined nearly 16% to NKr2.5 billion ($358 million) compared with NKr2.9 billion ($450 million) the previous year.

Losses in the second half of 1989 were less than in the first half and were largely due to a sharp reduction in personnel. During the year, the company cut its worldwide work force of 4,200 by almost one-third.

Included among those let go was Rolf Skår, Norsk Data's charismatic president. Skår, one of the company's founders, had headed the firm since the early 1970s. The board recommended Skår's removal on grounds that Norsk Data needed a financial specialist rather than a technician at the helm. Executive vice president Erik Engebretsen, who was formerly responsible for finance, sales and marketing, was named president.

Engebretsen has continued to implement the survival strategy that was formulated during the last part of Skår's term. Like so many other problem-plagued minicomputer makers, Norsk Data is putting its hopes on open systems, reduced instruction set computing (RISC) and the UNIX operating system, as well as systems integration and support.

As part of its survival strategy, Norsk created an independent company out of its research and development department. Dolphin Server Technology AS sells developments to, and accepts R&D assignments from other minicomputer makers. Dolphin's business is based on two products: the Triton 88, a high-performance UNIX network server, and the Orion, a follow-on server with higher performance. Orion is expected to be introduced in the first half of 1992.

Norsk's new president has also continued dividing the company into independent market-oriented profit centers, including central and local government, the newspaper industry, and small companies.

Even if some improvement in performance is seen by autumn, real cost savings are not expected to show up until 1991. First-quarter figures indicate that orders are up 1%. But it remains to be seen if this and the restructuring are sufficient to enable Norsk Data to survive as an independent systems supplier.

—Weje Sanden

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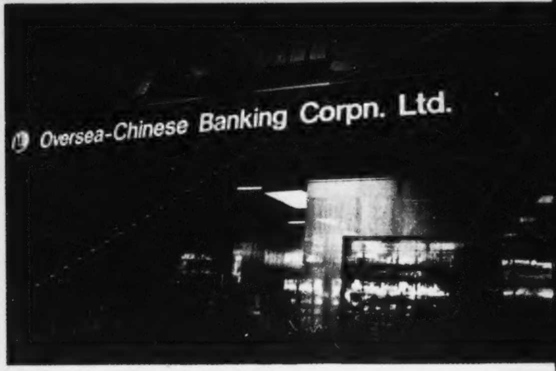
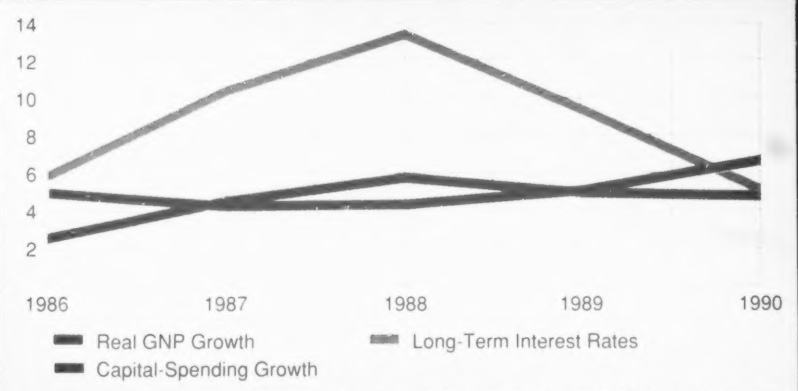


Automated banking at Singapore's airport is but one sign
IT health in Southeast Asia.

What's Driving the Asian Economy



Sources: International Monetary Fund and World Economic Outlook

electronics keep Japanese IT

THE DATAMATION 100

An economic boom in Southeast Asia should offset slowing growth in other Asian markets to create a double-digit rate of growth in information technology spending.

Why Japan Isn't The Hottest IT Spot In Asia

In the Pacific Rim, the Japanese economy is showing signs of the strain from its surging growth of the last few years, and the rates of economic growth in three other major markets—Hong Kong, South Korea and Taiwan—are moderating. Further south, however, the booming economic engines of Singapore and newly industrializing Thailand and Malaysia are creating an acute, urgent need for a stronger IS infrastructure. Such spectacular growth in Southeast Asia combined with respectable growth in other East Asian markets should fuel a 12 to 18% increase in information technology investments in the region in 1990.

"Inherent demand is enormous," says Bruce D. Johnson, director of Baring Securities Ltd. of Tokyo. "[But] we're in sort of a year-to-year relative position, that the economic

BY MARSHA JOHNSTON

cycle is slowing in East Asia. So compared to last year, we might see some slowing in the consumer-demand-related parts of it . . . [in] products individuals buy, PCs and some of the consumer telecom products. However, in the public demand, there is vast pressure to spend money for a wide variety of reasons. One is seeing enormous infrastructure investment, you know, like first-time industrialization [in Southeast Asia]."

The vibrancy of the region's growth is, however, closely tied to developments in Japan's economy. If the tightening of interest rates undertaken by the Bank of Japan at press time does not succeed in choking down further rises in over-inflated property prices and in coaxing the stock market down, Japan's economy could sink dramatically. Such a major collapse would ultimately drag down the region, since a high percentage of its economic growth, particularly in Southeast Asia, is predicated on Japanese investment.

Potential Political Unrest

A political jolt to the region could have the same effect. Undeniably, the region has some potentially explosive political wild cards—namely the often tense, pending reintegration of the People's Republic of China and Hong Kong, Taiwan's new political regime and its recent student unrest. But it's highly unlikely that anything worse than Tiananmen could happen that would depress the climate for investment in information technology.

Barring such economic or political shocks, the economies and concomitant demand for information systems should expand, with telecommunications, PCs and laptops leading the way. Certainly, the stars of growth in the eastern side of the Pacific Rim this year will be in Southeast Asia. "Singapore is by far the larger growing area," says Vangell M. Rafael, director of Software Vision Consultants of Hong Kong, who has worked many years in Southeast Asia for IT suppliers such as lessor Econocom International BV, which is based in Amsterdam. Its IS growth, he says, has flattened out in the last two years, "but it's still a bigger marketplace for companies than Hong Kong. Hong Kong makes sense to companies to be here for geographic/financial tax reasons, but it's not as large as Singapore and, for example, emerging Malaysia and Thailand."

Top Asian Achievers

Asian companies with the healthiest IS revenues

ASIAN RANK	WORLD RANK	COMPANY	IS REVENUE ($ MILLIONS)
1	3	NEC	11,480.4
2	4	Fujitsu	11,378.9
3	6	Hitachi	8,719.0
4	13	Toshiba	4,595.1
5	14	Canon	3,783.3
6	15	Matsushita	3,663.7
7	24	NTT	2,254.0
8	25	Nihon Unisys	2,112.7
9	29	Mitsubishi	2,025.7
10	30	Oki	1,952.0
11	33	Ricoh	1,799.5
12	40	Seiko Epson	1,449.5
13	42	C. Itoh	1,345.9
14	72	CSK	520.0
15	75	Acer	493.7
16	86	Alps	420.4
17	94	Mitac	380.0
18	97	Kyocera	366.4
19	105	Sony	326.1
20	106	Nomura	322.0
21	107	Intec	321.8
22	156	Daewoo	126.9

The Market in Malaysia

According to the 1989 annual report from Bank Negara, Malaysia's national bank, the Malaysian economy should grow by about 8.3% in 1990, due in large part to a three-year-old boom in foreign investment. That boom has resulted from rising costs in Japan, South Korea and Taiwan; appreciating foreign currencies; and infrastructural bottlenecks in Thailand. Barring inflation and unreasonable wage demands, Malaysia could sustain the growth until 1995, says Jaafar Ahmad, a senior economist at the bank. Private economists have noted that previous forecasts by the bank have been conservative.

Despite a communications infrastructure that makes it difficult even to complete a phone call, Thailand's National Economic and Social Development Board expects the 1989 economic growth rate to have been higher than its previous estimate of 10 to 11%. The board also revised its 1988 growth figure from 11 to 13.2%, the highest in 30 years.

"Thailand has great potential if they can overcome the problems of roads and data communications," says Software Vision's Rafael.

Because the local phone system can't cope with the volume of business in Thailand, cellular communication systems are growing by leaps and bounds. Baring Securities' Johnson says that even the cellular systems, however, get clogged up due to heavy traffic. PC use in Thailand is also proliferating. Taiwan-based Acer Inc.'s distributor, Sahaviriya, reported that its 1989 sales soared 50% to 1 billion baht ($40 million) over 1988's 683 million baht ($27.3 million).

In producing PCs, Singapore now makes them more cheaply than Taiwan, according to Takashi Nakatani, general manager for NEC Corp.'s Asia Business Systems Division. Indeed, adds Rafael, "Singapore's interested in developing the infrastructure to supply the hardware as well as the software. The government wants Singapore to be the Silicon Valley of the Far East and is throwing a lot of money into that."

Since it has few natural resources other than its people, Singapore is capitalizing on that to take a lead in emerging technologies. "Singapore is the best example of people who are trying to capitalize on what skills they have. The Singaporeans are investing in the future. Hong Kong Chinese are reaping what they can before the future

Big Exporters in Asia

Asian companies with the most IS sales outside their home markets

	1989 RANK	COMPANY	IS REVENUES N. AMER.	EUROPE	ASIA	OTHER
1	14	Canon	1,324.2	945.8	1,513.3	0.0
2	30	Oki	1,464.0	253.8	175.7	58.6
3	4	Fujitsu	910.3	455.2	10,013.5	0.0
4	6	Hitachi	871.9	348.8	7,498.4	0.0
5	3	NEC	688.8	459.2	10,332.4	0.0
6	15	Matsushita	439.6	293.1	2,931.0	0.0
7	40	Seiko Epson	420.4	289.9	739.3	0.0
8	33	Ricoh	503.9	197.9	1,097.7	0.0
9	13	Toshiba	275.7	367.6	3,951.8	0.0
10	42	C. Itoh	336.5	134.6	807.5	67.3

Revenue figures are in millions of dollars.

disappears," Rafael says.

Indeed. The leading Singapore newspaper, *The Straits Times*, frequently carries advertisements for people with expertise in gallium arsenide manufacturing. Singapore has had a countrywide electronic data interchange (EDI) system for trade transactions since January 1989, and Singapore Telecom recently announced an agreement with several foreign telephone companies to implement the first submarine fiber optic cable to span the Indian Ocean from Southeast Asia, through the Middle East, to Europe.

Seeing such projects through should not pose a problem, as "there's no shortage of cash in Southeast Asia; they've got the money in the economy," says Alan Bell, also of Baring Securities. "I think their political clout is such that they can attract the right sort of investment."

Is Japan's Downturn Just Beginning?

Much of such investment will come from Japan, unless the instabilities that still exist in the Japanese financial infrastructure—a weakening yen, higher interest rates, lower growth in corporate profits and an over-inflated property market—create an economic crisis. It is impossible to predict an upheaval, however. Some financial authorities, such as Credit Lyonnais, say the downturn is just beginning. Others, such as Daniel Gressel, an economist for G.T. Capital Management in San Francisco, contend that Japan's stock market declined in accordance with the natural laws of equilibrium.

The dire predictions do not account for the fact that the Japanese economy has successfully weathered worse times, namely the free-fall of the dollar and the oil embargo of the Organization of Petroleum Exporting Countries (OPEC). Investment banker Barclays de Zoete Wedd of Tokyo, says the wobbly economic factors should not prevent close to a 10% increase in capital investment in fiscal year 1990. It says Japan's severe labor shortage and growing domestic demand should fuel investments such as information systems that are designed to increase production capacity. Barclays expects about one-fifth of overall Japanese corporate investment in FY90 to go toward such expenditures, including IS. Consolidation in many industries in Japan, notably finance, is also creating pressure to spend money on technology.

The labor shortage, combined with political motivations of the ruling party to mend its tattered image with better service to its citizens, will ensure that the government IT market thrives this year. Bell says computerization in Japanese governmental organizations is happening, in particular, due to "the inability of government to hire people to do mundane things." As a result, he adds, optical disks are being used by local governments, the Ministry of Finance and the Japan Patent Office to store tax records, corporate records and patents, respectively.

The financial industry is a prime example of the consolidation in Japanese industry that is driving technology investment. "Virtually the whole of Japan is a series of local [financial] monopolies," says Baring Securities' Johnson. "As they deregulate and suddenly have 50 players in the whole area rather than one or two players in each separate area, it becomes more obvious that nobody has any particular value added over anyone else, which is driving everyone to try and create competitive advantage." To get that advantage, Scott Russell, deputy general manager of the information technology department at Tokyo-based S.G. Warburg Securities, confirms that "Japanese banks are pouring incredible amounts of money into technology."

Yuji Ogino, president of IDC Japan Ltd., expects overall IT purchases in Japan to grow about 12% in

What's Hot in Japan

Top Japanese PC suppliers

	1989 RANK	COMPANY	PC REV.	IS REV.
1	3	NEC	3,116.5	11,480.4
2	13	Toshiba	1,340.8	4,595.1
3	4	Fujitsu	869.7	11,378.9
4	6	Hitachi	652.3	8,719.0
5	40	Seiko Epson	579.8	1,449.5

Top Japanese service suppliers

	1989 RANK	COMPANY	SERVICE REV.	IS REV.
1	24	NTT	898.7	2,254.0
2	3	NEC	289.9	11,480.4
3	4	Fujitsu	253.7	11,378.9
4	6	Hitachi	181.2	8,719.0
5	42	C. Itoh	108.7	1,345.9

Revenue figures are in millions of dollars.

1990, with hardware-only revenues up 13% and software-only revenues up 15%. Systems integration revenues will be the star, he says, growing at more than 30%, which should result in a ¥1.2 trillion market by 1992. Of total IT expenditures, office automation systems and telecommunications figure most prominently. An annual forecast of the country's leading goods and services by the daily *Keizai Shinbun* projects that PCs will be second only to credit cards in 1990, growing at 12%. Optical fiber rates fourth or fifth, with a growth rate of 7%.

"In Japan you've got people carrying notebooks [computers], people carrying a portable telephone, people having a nonportable phone on the train, fax machines in cars," says Baring Securities' Johnson. "Communications in Japan is becoming multidimensional and omnipresent, and though it's not bottlenecked necessarily, it's very stretched."

The projected rate of growth in fiber optics is thus no surprise, as Nippon Telegraph and Telephone Corp. has targeted 40% of its domestic switching systems to be digitized this year. A trans-Pacific fiber optic cable is also on schedule.

While not plagued by a labor shortage as Japan is, South Korea and Taiwan have seen their labor costs and currency valuations skyrocket in the last few years. Over the last three years, real labor costs in South Korea have gone up around 200%. Between September 1986 and December 1989, the cost of labor in Taiwan rose approximately 150%, and the new Taiwan dollar (NTD) appreciated about 45%. Although South Korea's export-driven economy has been slumping since last year, neither country's economy seems threatened with disaster.

South Korea's market for IT is, for instance, still second only to Japan's. Tony Tsang, a general manager for Wang Pacific Ltd., says: "Three years ago, we [at Wang] bought out our Korean distributor because the market was just getting too big for a distributor to handle. South Korea is becoming the second-largest market—$1.5 billion in 1989 and well on its way to $2 billion."

Says Sung Kyou Park, president of Daewoo Telecom Co. Ltd. of Seoul, "We may not see very high-paced growth, but the economy will grow, and of course [there are] some problems to solve. Traditionally, people looked upon this part of the world as the area where the economy was growing due to inexpensive labor. But the labor cost in this part of the world has gone up very, very fast, especially in South Korea.

"In order to absorb that kind of expensive labor cost, we have to go through many structural changes," Park says. "We have to develop different types of products that have more value added so we can be competitive in the world market."

No doubt due in part to the uncertainty surrounding such change, South Korea's stock index has fallen by about 10% so far this year and has stood at its lowest level since the start of last year. But most analysts expect South Korea's growth to accelerate in the second half of the year.

The Ups and Downs in Asia

The companies that grew the most in 1989

	1989 RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	% INCREASE
1	97	Kyocera	366.4	258.5	41.7%
2	24	NTT	2,254.0	1,694.0	33.1%
3	75	Acer	493.7	379.4	30.1%
4	94	Mitac	380.0	293.3	29.6%

The companies that couldn't keep up in 1989

	1989 RANK	COMPANY	1989 IS REVENUE	1988 IS REVENUE	% DECREASE
1	86	Alps	420.4	526.7	(20.2)%
2	40	Seiko Epson	1,449.5	1,487.7	(2.6)%
3	107	Intec	321.8	326.0	(1.3)%

Revenue figures are in millions of dollars.

Taiwan's economy is in much the same position as South Korea's, save for a lower concentration of heavy industry. IT already figures prominently in the continued growth of the domestic economy, which is also being forced by high labor costs to shift to more value-added products, such as software, that are sold under brand names, not via original equipment manufacturer (OEM) channels. The Taipei-based Institute for Information Industry (III) says its IT industry, including software, should reach $7.5 billion in 1990. "Even though Taiwan is very important to the world information industry, there is not much brand name recognition. We have to promote brand names aggressively. Also, to compete with Korean companies, we have to create [more] value-added products," says Max Wu, vice president of market promotion for Acer.

Developing markets for those products is a top priority for both countries. Daewoo has set up a European marketing network. The Soviet Union and Eastern Europe also represent important potential business for Korean and other East Asian IT suppliers. East Asian suppliers finalizing deals for supply or assembly of PCs in those regions include South Korea's Lucky Goldstar, Singapore's Wearnes Technology and Malaysia's Accent Technology SB (ATSB). Paul Liu, president of Taiwanese laptop maker Aquarius Systems, says 20% of its anticipated 1990 sales of $30 million will be to Eastern Europe. Acer seems to have successfully globalized its operations. One of the top three suppliers in over 15 countries, Acer says it is No. 1 in Bahrain, Bolivia, Chile, Cyprus, Jordan, Taiwan and Thailand.

OEM, not brand name, business continues to be

Taiwan's bread and butter, despite the increases in labor costs. "Everyone said that after the Taiwan dollar was appreciated 45% and the labor costs here went up 150%, the buyers would start going to mainland China, Indonesia and all that. Well, some did, but instability and unreliable supplies just drew all the buyers right back to Taiwan. Overall, Taiwan's exports have continued to grow at 20 to 30%," says David Lightle, consultant to the Brand International Promotion Association (BIPA) in Taipei.

The Taiwanese software industry is, however, not yet mature enough to start exporting its product; III says the industry will have to wait until the copyright law changes before it can export. In the meantime, says BIPA's Lightle, "Taiwan has been contracted to do a lot of [OEM] software development for IBM. That's a major, major project, hundreds of millions of dollars for IBM Taiwan."

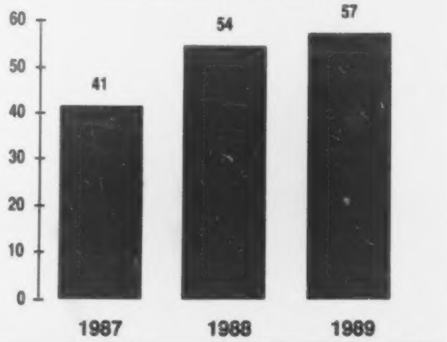
Whether its IT industry continues to be OEM or becomes predominantly brand name, one of Taiwan's greatest strengths is its engineering and sheer brain power, says Jackson Lin, general manager of Wang Industrial Co. Ltd. in Taipei. Furthermore, says Lightle, the historical drain on that resource is reversing. "Salaries are up into the $50,000-a-year range for top flight engineers, so more are saying, 'Why should I think about getting a better life in San Francisco when I can come back home?' And companies like Acer are snapping them up," he says. "Brain drain is not a problem for Taiwan anymore; they're getting enough back now to support the boom in high tech. It's Hong Kong that is losing everybody."

Hong Kong's Growth Is Slowing

An emigration of talented IS pros from the Fragrant Harbor has been one dear price Hong Kong has paid for Britain's decision to give it back to China in 1997. Its economy also has suffered from the events of last June in Beijing. Before Tiananmen, Hong Kong's trade with China was growing at an annual rate of 35%; it fell to 3% for the third quarter of 1989. Analysts expect Hong Kong's gross domestic product growth rate to slow to around 2.5% this year, in large part because the regime in Beijing slammed on the brakes of political and economic reform. Growth should not drop below that, as government projects already under way and the commitment of long-time Hong Kong corporations to stay should keep the demand for information systems strong.

Asia Surges

Total IS sales for DTM 100 Asian companies ($ billions)



A 1989 member survey by the Hong Kong Computer Society found that over 40% of the top IS professionals intended to leave the territory within the next 18 months for Canada or Australia or the United States. "What's happening is you're having middle management, the 30- to 35-year-old experienced guys, migrating to Canada, Australia, switching their passports," says Graham Glover, area head of the information systems division for Standard Chartered Bank. "They're the ones that really hurt when they go because these are the guys that you're reliant upon, who understand how the organization works." Surprisingly, Standard Chartered had less staff turnover in 1989 than in 1988, with about 30% turnover in 1988 and 15% last year.

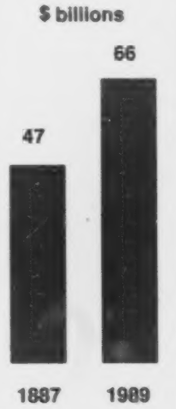
Says Software Vision's Rafael, "Clearly, that has an effect on the information technology industry. The dependence that companies had before on in-house expertise doesn't exist. There is no in-house expertise." As a result, IT suppliers will have to provide systems expertise for the government's infrastructure projects, namely the HK$127 billion new Chek Lap Kok Airport and a new port. The government may also choose to implement an EDI system for trading, called Tradelink, by 1991.

"The Hong Kong government has been sharply increasing its IT spending, upgrading the DP agency to a full department status," says Wang's Tsang. "The increase in its staff is close to a tripling since the current director took over. Various things have led to it: partly 1997; next year will be another 10-year census; and also the first large scale, direct election of the city council. The labor problem [shortage] has created a keener sense of automating."

Some corporations, such as Standard Charter, are following the government's lead. "We, in IT terms, are putting most of our efforts into Hong Kong. Not all projects have been developed in Hong Kong, but by far the majority of them," Glover says.

Veterans like A.F.M. "Con" Conway, director, major accounts group, at Hong Kong Telecommunications Ltd., who has been in the Hong Kong IT industry for nearly 30 years, see no reason for concern. "In Hong Kong, we're a very large user of information technology . . . [and] it will continue to increase—I would see a 10% compound—provided we get the various issues correct."

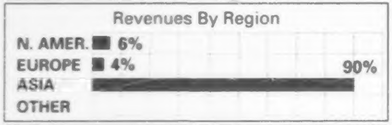
One of those issues, he says, is getting the regulations of the Coordinating Committee for Multilateral Export Controls (CoCom) changed to accommodate Hong Kong in 1997. "The situation arises that on Tuesday, the 1st of July, 1997, we're technically part of China and not part of Britain. Therefore, all goods being shipped into Hong Kong will be shipped as if they were shipped to China. The vast majority of goods on that list would not get a license for China, [but] all of these products could come into Hong Kong without a matter of hindrance at the moment," Conway says. ▭



Asia spent $66 billion on IS in 1989, up 40% from 1987.

IS Revenues: $11.48 Billion

REGION **1** — **NEC** — WORLD **3**



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(81-3)-454-1111

In 1989, NEC Corp. recognized that the market in Japan for intelligent buildings (IB), which sport integrated information systems (IS) facilities, is an excellent way to leverage its expertise in computers and communications (C&C). To better serve the ¥200 billion ($1.5 billion) market that is growing at 20% per annum, NEC upgraded its section devoted to IB engineering to a division, called the C&C Intelligent Building Systems Division. As of July 1989, NEC's share of the market was 15%, which the company hopes to boost to 20% by mid-1992.

Pioneering new markets is important for NEC. Its IS revenues for the period between September 1988 and September 1989 were ¥1.58 trillion ($11.5 billion) or nearly 50% of total sales, and represented an 18% gain over calendar year 1988 figures. NEC's net income was down marginally to ¥71.6 billion ($518.9 million).

Supercomputing is not a new market for NEC, but the company is busy trying to increase its market share in the United States and Europe, selling the new SX-3 through both direct and local sales subsidiaries. In the United States, NEC is marketing the SX-3 through its sales subsidiary, HNSX Supercomputers Inc. The SX-3 series should be available on the U.S. market sometime between July and September of this year. NEC says it hopes to avoid trade friction with Washington by concentrating supercomputer sales in the private sector.

NEC made new mainframe and midrange product introductions in 1989 to reinforce and expand its market share. The ACOS mainframe line acquired a new midrange model, the ACOS 3400, running at between 1.3 and 9.3 million instructions per second. Meanwhile, sales of the smaller ACOS 3300 (0.5 to 2.3MIPS) series continues to be strong; a total of 2,000 were sold in Japan and overseas between its introduction in late 1987 and September 1989. As part of its ongoing, heated competition with Fujitsu Ltd. and others in the Japanese small-business computer (SBC) market, the company introduced a 32-bit laptop model of its 3100 series of SBCs.

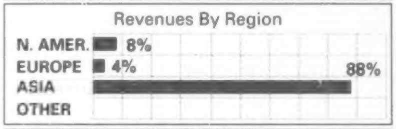
Meanwhile, at the other end of the market, NEC unveiled in October a notebook-sized personal computer which is 1.7 inches thick and weighs in at 6 pounds. This PC-9801N is marketed as the 98 Note. The popularity of notebook computers among Japan's users, particularly in finance, contributed to the company shipping 20,000 units in December alone. The 98 Note is compatible with NEC's PC-9800 series of PCs for which 4,800 application software packages are available. Overseas, NEC unveiled a similar unit, the Ultralite, which is a scant 1.1 inches thick and weighs 4.4 pounds. The difference is that the Ultralite uses integrated circuit cards rather than floppy disks.

Another attempt to increase market share last year, this time in the exploding local government IS market, put NEC smack in the middle of the "¥1 discount" scandal. The incident caused NEC, as well as Fujitsu, to come under harsh criticism for locking out competitors and denigrating the value of software development by submitting below-cost ¥1 bids for two local government computer system design contracts. Both companies have promised not to do so again, but the high-growth potential of the local government market will keep it a tempting target for undercutting the competition.

—Steve McClure

IS Revenues: $11.38 Billion

REGION **2** — **FUJITSU** — WORLD **4**



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(81-3)-216-3211

For Fujitsu Ltd., Japan's biggest computer maker, 1989 was the Year of FM Towns, its new 80386-based 32-bit personal computer. Fujitsu sees FM Towns, which uses a compact disc read only memory (CD-ROM) drive, sports arcade caliber graphics and impressive sound, as the centerpiece of its challenge to NEC Corp.'s dominance of the Japanese PC market. However, despite the company's high hopes for FM Towns, the PC has received less than rave reviews, which did not measure up to Fujitsu's expectations.

The marketing strategy for FM Towns had several problems. One may have been trying to market it initially as a home computer. Although it sells for less than ¥400,000 ($2,900), most Japanese consumers consider that a lot of money, not to mention a lot of computer, for a home PC used for video games and typically simple home applications. Later in the year, Fujitsu seemed to change its mind about the best market for FM Towns, reorienting its campaign toward businesses.

NEC looks to increase its market share in supercomputing.

Another problem seemed to be a lack of CD-ROM-based software, particularly for business use. The company admits that the slower than anticipated pace of CD-ROM software development hindered sales. Indeed, at about 5,000 units a month, early sales lagged far behind initial projections of 7,700 units a month through March 1990. The company says that at a Fujitsu product showcase in the latter half of the year, it demonstrated to customers a considerably larger repertoire of business software. This may have helped sales, which, Fujitsu claims, picked up toward the end of 1989.

Sales of FM Towns in both markets must continue to increase if Fujitsu is to reach its goal of capturing 30% of Japan's PC market over the next three years. The firm now has just over 13% of that market on a production-volume basis.

Despite initially slow sales for FM Towns, overall information systems revenues for Fujitsu, for the period between

THE DATAMATION 100

September 1988 and September 1989, grew to ¥1.6 trillion ($11.4 billion), about 11.4% higher than calendar 1988 sales.

Other PC news for Fujitsu in 1989 includes its purchase of a 38% stake in Sunnyvale, Calif.-based Poqet Computer Corp. and the introduction of its first color laptop, the 32-bit FMR-50LX6. The deal was designed to help Poqet market its PQ/XT, a pocket-sized IBM-compatible PC that operates on two dry cell batteries for more than 100 hours. It is scheduled to go on sale in autumn of 1990.

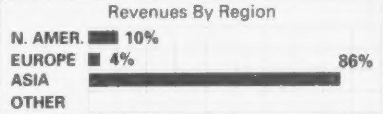
In the Japanese mainframe market, Fujitsu held on to its lead, with a 32% share in terms of units sold. In June, eight months after Fujitsu paid IBM $833 million to settle their software copyright dispute, the Japanese computer giant introduced MSP-EX, a new operating system, which Fujitsu says boosts compatibility between its mainframes and IBM's. The system is capable of 1 million transactions per hour, 10 times faster than previous Fujitsu operating systems. In September, Fujitsu announced it will export MSP-EX to West Germany's Siemens AG on an original equipment manufacturer (OEM) basis, in what it says is a first for a Japanese computer company.

Fujitsu, along with rival NEC, found itself in hot water last summer when it submitted preemptive ¥1 bids for two local government computer system design contracts. Both companies withdrew the bids after the Japanese Fair Trade Commission warned that such practices could be punishable under the Anti-Monopoly Law—but not before after they had received a lot of bad press. —*Steve McClure*

IS Revenues: $8.72 Billion

REGION		WORLD
3	**HITACHI**	6

Revenues By Region



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Hitachi Ltd. continued to concentrate on the domestic information systems market in 1989 in its ongoing effort to counteract the effects of the strong yen. The company also took strides to keep up with other Japanese IS firms making aggressive moves to enhance long-term prospects overseas. Hitachi's overall sales between September 1988 and September 1989 rose 13% over calendar year 1988 figures to ¥6.8 trillion ($49.1 billion). Computers led that growth, with sales for the year ending September 1989 reaching ¥1.2 trillion ($8.7 billion), up about 13.8% over calendar 1988's computer sales.

Hitachi's increased attention to the midrange and workstation arena paid off, reaping sales of ¥75 billion ($544 million). The major customers that have been the key to this growth are banks, financial firms and securities companies. Hitachi sees great growth potential in the manufacturing and distribution industries, as more Japanese companies in those sectors computerize their operations. In order to meet what it expects to be an increase in demand for workstations, Hitachi last summer unveiled new 16-bit and 32-bit models in its 2020 and 2050 series.

To boost demand for supercomputers and to offset criticism that Japanese computer makers offer academic institutions unreasonably big discounts for supercomputer rentals, Hitachi reduced rental charges to all of its customers on all four models of its HITAC S-820 supercomputer series by 25 to 35% in September. With an eye to its future in supercomputing, Hitachi developed an experimental superconductive supercomputer in 1989. The experimental unit features Josephson Junction processors and can carry out 250 million operations per second.

Overseas moves for Hitachi last year included its $398 million April purchase, in cooperation with Electronic Data Systems Corp. (EDS), of National Advanced Systems Inc. (NAS), the mainframe subsidiary of National Semiconductor Corp. NAS became Hitachi Data Systems Corp., with the Japanese firm holding an 80% share. The move was hailed as a bold one and has two key advantages, according to Hitachi. It ensures that NAS will continue to remarket Hitachi IBM-compatible mainframes and memory devices in the United States and Europe, and the link with EDS should strengthen Hitachi's hand in software development.

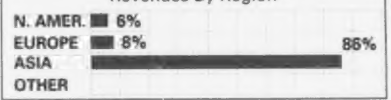
In Europe, where its IS sales remain weak, Hitachi announced that Hitachi Semiconductor (Europe) GmbH, established in 1980, will begin integrated production of semiconductors in 1992 in Landshut, West Germany. Work on the Landshut plant is set to begin this spring. In anticipation of increased business in Eastern Europe, Hitachi has set up a section in its international division to deal exclusively with that part of the world.

Meanwhile, Hitachi Europe's research and development division established two laboratories in 1989. One, in Cambridge, England, will conduct microelectronics research, whereas the other, in Dublin, will engage in information science research. Hitachi also established its first labs in the United States—one in San Francisco for semiconductor-related R&D and the other in Detroit for auto industry-related research. —*Steve McClure*

IS Revenues: $4.6 Billion

REGION		WORLD
4	**TOSHIBA**	13

Revenues By Region



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Last year, Toshiba Corp. took Japan's laptop market by storm with Dynabook, which weighs just under 6 pounds, and at ¥190,000 ($1,375), costs less than half the price of Seiko Epson Corp.'s similar model. Just over six months after its July launch, Dynabook surpassed its annual sales target of 60,000 units, and Toshiba is now confident of selling another 60,000 by this summer. Seven months after its launch, Toshiba introduced six new Dynabook versions, one of which includes a hard disk. "Dynabook brought computers within the reach even of university students," says Shigenori Matsushita of Toshiba's Information Processing Group. He adds: "Our product actually helped expand Japan's PC market as a whole."

Despite a rapid 20% annual growth, Japan's PC market is less than one-tenth the size of the U.S. market. Even at Toshiba's central Tokyo office, there is only one PC unit for every two or three employees. Indeed, keyboards are still alien to most Japanese, who have been brought up on brush and ink rather than typewriters; many middle-aged Japanese have never touched a keyboard of any kind. "It mainly stems from our cultural tradition," explains Matsushita. "But it means that there is room for growth [in PC use]."

Internationally, Toshiba has a reputation for laptop computers, but those sales constitute merely 30% of the company's total information systems revenues. The overwhelming majority of sales is generated by midrange computers, workstations and peripherals—with the midrange remaining the core of Toshiba's domestic computer business. Toshiba does not produce mainframe computers, but is beginning to succeed in muscling into this market with a system that combines sophisticated midrange computers and microcomputers. "The traditional computer system in major corporations of a big host computer and dozens of dumb terminals has proven to be highly inefficient," explains Matsushita. Over the past 10 years, Toshiba has been developing decentralized systems using midrange computers, sales of which Matsushita expects to increase by 12% this year

Toshiba's IS revenues were ¥634 billion ($4.6 billion) for the period from September 1988 to September 1989, with net income at ¥129 billion ($935 million).

Over 100 hotels in Japan, including those owned by the fast-growing All Nippon Airways—Japan's No.2 carrier—have so far installed Toshiba's midrange systems. Hospitals are another area of Toshiba's strength for these systems. However, these sales successes have so far been limited to the domestic market, unlike Toshiba's success with its laptop products. "You have to develop close relations with your clients—something that's very difficult to do in foreign markets," says Matsushita. "In the PC markets, it's a different matter altogether; the products sell themselves." That Toshiba was quick off the mark in tapping into huge overseas PC markets also contributed to its success there.

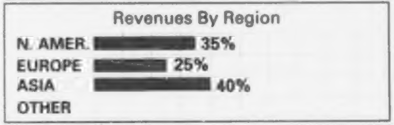
Toshiba's best-selling laptops—the 3100, 2100 and 1100 series—were all launched first overseas, and the company now commands a 48% share in Europe and a 28% share in the United States. In 1987, Toshiba opened a U.S. manufacturing base in Irvine, Calif., which has an annual output of 15,000 units. Toshiba's West German plant was scheduled to begin operations this past April, producing 5,000 units annually. Most components for both plants are supplied locally, with the exception of flat displays, keyboards, floppy disks and large scale integrated circuits. "These are the components which have to be shipped directly from Japan to ensure high quality," says Matsushita.

Via a recent original equipment manufacturer (OEM) agreement with Sun Microsystems Inc., Toshiba is also intent on expanding its share of Japan's workstation market. "We mean to be No.1 in every area of our computer business," Matsushita concludes confidently.

—Nobuko Hara

IS Revenues: $3.78 Billion

REGION		WORLD
5	CANON	14



CANON INC.

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Peripherals brightened up an otherwise dull year at Canon Inc., as sales of laser printers and facsimile machines boosted information systems revenues for the 12 months ended in September 1989 by a robust 20% over calender 1988 figures up to ¥522 billion ($3.8 billion). Indeed, sales of peripherals alone, primarily laser printers, increased 52% to ¥270 billion ($2 billion). The company's overall sales rose 18% to ¥1.3 trillion ($9.8 billion), but net income stayed almost the same as that for the 1988 calendar year, at ¥38.2 billion ($276.9 million).

Canon, one of the most aggressive seekers of business around, has continued to increase its activities overseas, with a 74% export ratio, 63% of which is denominated in U.S. dollars. In the first half of the year, the firm concluded its contracts at a rate of ¥127 to the dollar, but with the yen dropping below 150 to the dollar, Canon's earnings picture will likely change radically for the better.

Canon's dominance of the laser printer field continues unchallenged. The firm has 70% of the domestic laser printer market and 80% of the overseas market. In March of 1989, the company announced plans to build a factory in Britain within the next two years to produce laser printers and fax machines.

Canon's strength in peripherals contrasts with its continued weak showing in the rest of the Japanese IS market, where analysts say the company's future remains very much in doubt. In an effort to get a leg up in the computer field, Canon paid $100 million in June for one-sixth of Steve Jobs' Next Inc. and exclusive marketing rights in Asia for the Next machine. While some observers see Canon's move as an attempt to develop its own computer business, the firm says the deal represents merely an ideal hardware/software combination. Canon has set up its own software development group and expects to have Japanese software ready for the Next computer by this summer. The Next machine uses Canon's 5¼-inch erasable optical disk, which has 256 megabytes of memory. Analysts say the disks are likely to become a major product line for Canon, and one estimate is that they will earn the company more than ¥100 billion ($725 million) by 1995.

Whether that can be realized depends on whether Canon learned from its failures in marketing Apple Computer Inc.'s systems in Japan in the mid-1980s. Having little experience in marketing integrated information systems, Canon failed to provide adequate maintenance for both hardware and software. Now, the company plans to focus on supporting Next systems in this effort.

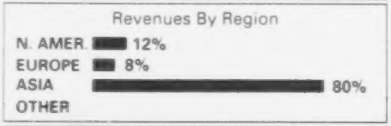
Matsushita steps up to the world stage with PCs and workstations.

Meanwhile, Canon found itself in hot water with Japan's Fair Trade Commission (FTC) in October. The FTC raided 39 Canon sales offices in search of evidence that the company had been trying to keep prices of Apple computers high by shutting out of the market those distributors that were undercutting Canon's Apple prices. Reports said that Canon had pressured magazines not to take advertisements from such companies. The FTC has yet to file its report, but skeptical observers note that while Japanese law can order companies to halt such practices, the FTC does not have the power to impose fines or other forms of punishment.

In management, Canon had one major change in 1989. Executive vice president Keizo Yamaji took over Canon's presidency in February, while Ryuzaburo Kaku moved from the presidency to the chairmanship. —*Steve McClure*

IS Revenues: $3.66 Billion

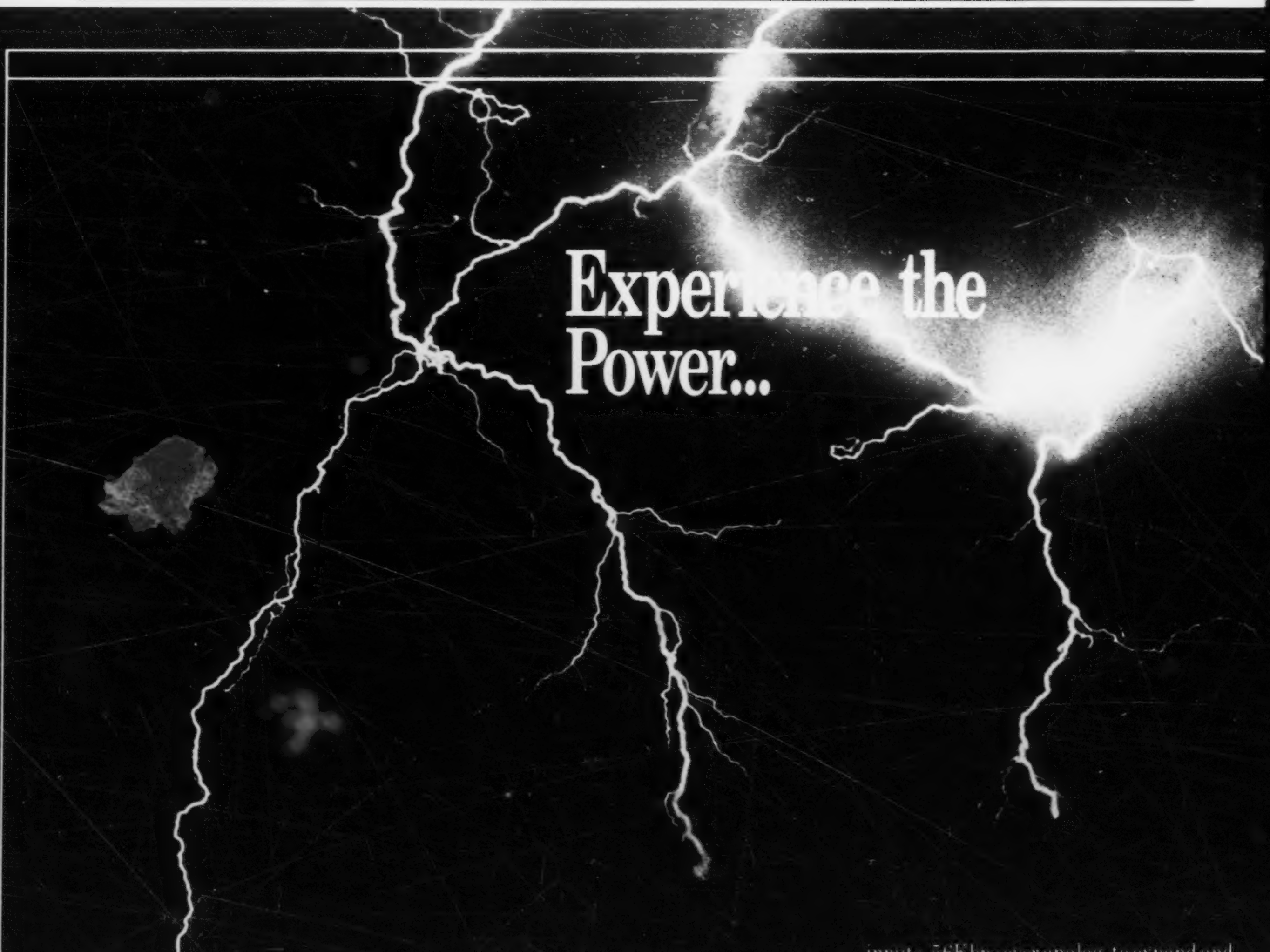
REGION		WORLD
6	MATSUSHITA	15



MATSUSHITA ELECTRIC INDUSTRIAL CO. LTD.

1006 Oazakadoma
Kadoma-shi, Osaka-fu 571, Japan
(81-6)-908-1121

Matsushita Electric Industrial Co. Ltd. successfully continued its increased emphasis on information systems last year. While many areas of Japan's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consumer electronics market approach saturation, Matsushita's IS division is prospering, once more leading other company sectors in growth. For the year ending September 1989, the IS division had revenues of ¥506 billion ($3.7 billion), up 15% over calendar 1988 figures. Meanwhile, the firm's overall revenues rose 9.4% to ¥5.6 trillion ($40.9 billion).

Whether Matsushita will ultimately join the ranks of Fujitsu Ltd. and NEC Corp. in the IS business remains to be seen. Realizing it cannot hope to introduce an entire range of systems in one fell swoop, the company has chosen to concentrate its efforts on PCs and workstations, areas that seem to have the greatest potential. Having abandoned the mainframe field in 1964, Matsushita has no plans to reenter that arena.

In October, Matsushita introduced to the domestic market the first model in its UNIX-based 32-bit BE office workstation series, which it hopes will capture a good share of Japan's growing office automation market. Last year, Matsushita also shifted production of its 32-bit engineering workstations to the United States. The workstations are designed by Longmont, Colo.-based Solbourne Com-

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puter Inc., of which Matsushita is part owner.

Matsushita resumed exports of PCs to Europe and North America last fall for the first time since 1987, in the wake of with the resolution of a copyright dispute with IBM which had forced it to halt overseas PC shipments. Matsushita is now making 8-, 16- and 32-bit IBM-compatible laptops in Japan to be sold in Europe under the Panasonic brand name, while Tandy Corp. is making 16- and 32-bit models in the United States on an original equipment manufacturing (OEM) basis. Similarly, Fujitsu last year began supplying Matsushita with its 32-bit FM Towns PC on an OEM basis for the Japanese domestic market.

To help make inroads into the PC market, where it is still an also-ran, Matsushita last year set up the Matsushita Computer Co. (MAC) in Tokyo to specialize in workstation sales, support and systems integration. In a departure from standard Japanese corporate practice, Matsushita has lured experienced personnel away from other companies rather than staffing MAC with Matsushita employees. Although MAC will be headed by Matsushita managing director Shigeuki Nishiuma, it will have considerable autonomy in day-to-day operations.

President of Nihon Unisys, Mr. Koichiro Nishikawa.

Although Matsushita lost its founder, Konosuke Matsushita, in April 1989 at the age of 94, the company has gone on with little change. In March of last year, Richard Kraft, a 15-year veteran of Matsushita's U.S. operations, was appointed to the post of president and chief operating officer, succeeding Akiya Imura. As the first American to occupy the position, he may help Matsushita deal more effectively with U.S. concerns about Japanese trade and investment policies in the United States.

—Steve McClure

IS Revenues: $2.25 Billion

REGION		WORLD
7	NTT	24

Revenues By Region

N. AMER.	
EUROPE	
ASIA	100%
OTHER	

NTT DATA COMMUNICATIONS SYSTEMS CORP.
17 Mori Building
26-5 Toranomon 1-chome
Minato-ku, Tokyo 105, Japan
(81-3)-509-4647

While its parent company, Nippon Telegraph and Telephone Corp. (NTT), flounders as the result of the arrest of three former executives for bribery and the prospect of being broken up into smaller companies, NTT Data Communications Systems Corp. continues to do well.

Since being spun off from NTT in May of 1988, NTT Data has taken the lead in Japan's annual ¥348 billion ($2.5 billion) systems integration market, which is a growing at a rate of some 32% per year. Because it is the only company in Japan that handles all aspects of systems integration—designing, installing, operating and maintaining information systems—NTT Data looks well positioned to maintain its No.1 spot.

In its first (partial) year of operations, from May 1988 to March 31, 1989, NTT Data registered a net loss of ¥7.6 billion ($59 million) on sales of ¥228 billion ($1.8 billion) because of a one-time transfer of retirement benefits from NTT. But for the year that ended September 30, 1989, the company recorded a net income of ¥3.2 billion ($23.5 million) on sales of ¥311 billion ($225 billion). NTT still owns 100% of NTT Data, but if the

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subsidiary continues registering a solid business performance, its shares should be listed publicly in 1992.

Large public and financial concerns account for 80% of NTT Data's sales, but the firm is targeting smaller companies, especially in the manufacturing field, in the belief that their demand for systems integration will grow. Analysts say NTT Data's ability to market its services is the key to its future.

In response to Japan's shortage of software engineers, NTT Data last year set up software development offices in Japanese regional centers such as Nagoya, Osaka and Sapporo. Each office will be staffed with about 10 software specialists assigned by the Tokyo headquarters; NTT Data's goal is to have at least 100 employees at each office.

One of NTT Data's biggest projects in 1989 was designing a system using Hitachi Ltd. mainframes and Fujitsu Ltd. terminals for the Tokyo International Financial Futures Exchange, which began operations in June. Another highlight of 1989 was the increased use of NTT Data's Automatic Answer Network for Electronic Request (ANSER) system, through which bank customers can gain access to information concerning their accounts by using fax machines, PCs, telephones or dedicated home use terminals. The nationwide ANSER network now handles 25 million calls a month.

—Steve McClure

IS Revenues: $2.11 Billion

REGION		WORLD
8	NIHON UNISYS	25

Revenues By Region

N. AMER.	
EUROPE	
ASIA	100%
OTHER	

NIHON UNISYS LTD.
17-51 Akasaka 2-chome
Minato-ku, Tokyo 107, Japan
(81-3)-585-4111

In the face of stagnating growth in Japan's mainframe computer market, Nihon Unisys Ltd. recorded a healthy 11% growth in revenues to ¥291.5 billion ($2.1 billion) last year. "We are happy with last year's results," says Hiroshi Yoshida, Nihon Unisys' director of corporate communications. Much of the growth resulted from the sale of the company's new 2200-600 midrange series. New 2200-600s were installed at Japan's second largest airline, All Nippon Airways (ANA), in a multibillion-yen sale; at Japan's two leading car manufacturing firms, Toyota Motor Corp. and Nissan Motor Co. Ltd.; and also in Yamaichi Securities, one of Japan's four major brokerage houses. The ANA deal was the culmination of several years that Nihon Unisys spent developing a new computerized reservation system for the carrier and represented its biggest sale in 1989.

Currently, Nihon Unisys imports half its products from the United States, with the rest manufactured by Japanese companies such as Oki Electric Industry Co. Ltd.—a minority shareholder. However, prompted by problems in production of the 2200-400 series, management is increasing domestic production to ensure faster delivery and higher quality. The series, launched in March 1988, was not delivered until April 1989 due to production delays in the United States—the sort of problem for which Japanese clients have little patience. "Luckily, we didn't have any cancellation of local orders [as a result]," says Yoshida. Oki began producing the computer last June, and today 40 units roll off Oki's production line every month. Management asserts that the output is likely to increase this year because the United States still has a backlog of orders.

Despite its expertise in mainframe technology, Nihon Unisys is painfully aware of its shortcomings in the PC market, which is expanding by more than 20% annually. But a PC sold by a U.S. counterpart, lacking any Japanese language capability, is of no help. Currently, Nihon Unisys is forced to sell Toshiba Corp.'s J-3100 to its clients who insist on a completely networked PC system. The UP10 PC, jointly developed with Sanyo Electric Co. several years ago, has long since become obsolete. In any case, Japan's complex distribution system means that a huge initial investment would be necessary for Unisys to break into the PC market—and it is probably too late to start completely from scratch. "Our only way would be to tie up with a company like Seiko Epson, which is strong in PCs

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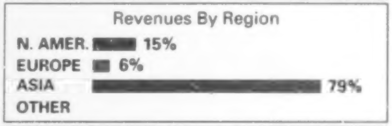
but lacks what we've got," Yoshida points out.

In the Japanese mainframe market, too, competition is intensifying. But Nihon Unisys has an unshakable reputation for excellent system engineering, a reputation that was confirmed yet again last year when Japan's best-selling computer monthly, *Nikkei Computers*, gave it the top rating. "We are not in competition for hardware anymore. What clients are looking for now is personalized services and design capabilities," Yoshida says.

—Nobuko Hara

IS Revenues: $2.03 Billion

REGION **9** **MITSUBISHI** WORLD **29**



MITSUBISHI ELECTRIC CORP.

2-3 Marunouchi 2-chome
Chiyoda-ku, Tokyo 100, Japan
(81-3)-218-2111

In 1989, Mitsubishi Electric Corp. continued its steps to offset the appreciation of the yen, streamlining operations and product development, boosting overseas procurement and transplanting production into other countries. Exemplary of the trend was the establishment on January 1, 1989, of Mitsubishi Electric France SA, a $3 million wholly owned subsidiary headquartered in Paris. The company's first product, which will be manufactured in Entrelles, France, will be cellular mobile telephones.

These moves may have been responsible for Mitsubishi's strong information systems sales across the board. Despite a softening of the dynamic random access memory (DRAM) market, IS sales for the year ending in September 1989 increased 6% over calendar 1988 figures, reaching ¥279.5 billion ($2 billion). Total corporate revenues were ¥2.9 trillion ($21 billion). Net income, including that for IS, grew to ¥67.4 billion ($488.5 million), a 97% rise from 1988.

Within the company's information-processing systems business, which ranges from PCs to general purpose mainframes, sales for mainframes were not as successful last year as had been hoped. Mitsubishi had pushed to reestablish itself in the mainframe market by introducing the new Cosmos and EX series models, but due largely to inadequate applications and operating system software, the attempt fell short of the mark. According to a report from Tokyo-based S.G. Warburg Securities (Japan) Inc., the company had sold 57 Cosmos and 48 EX series models as of September 1989, about 40% fewer than projected.

Also in 1989, Mitsubishi introduced an upgraded version of its 16-bit EX series office computers, the 32-bit Gureo line, which is packaged with a high-speed relational database management system. Sales for the system were slow, but Mitsubishi fared better with its Maxy series of 16- and 32-bit desktop and laptop PCs, which also came on line last year.

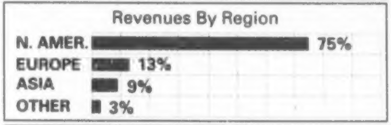
Improvements in disk drives continued with the October 1989 introduction of an erasable optical magnetic disk drive. Innovations in peripherals included digitally operated color printers capable of reproducing 16.7 million colors for design and publishing applications.

Mitsubishi's strength in the semiconductor and defense electronics business also continued. As a major DRAM supplier, the company sold ¥376 billion ($2.7 billion) worth of semiconductors last year, a 42% increase.

—Peggy Trautman

IS Revenues: $1.95 Billion

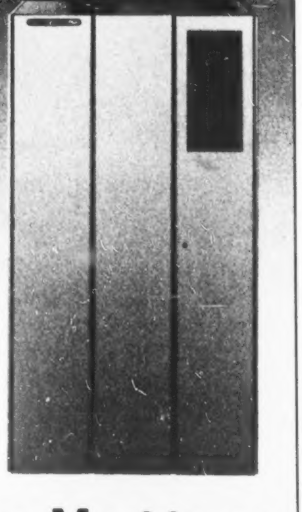
REGION **10** **OKI** WORLD **30**



OKI ELECTRIC INDUSTRY CO. LTD.

7-12 Toranomon 1-chome
Minato-ku, Tokyo 105, Japan
(81-3)-501-3111

Oki Electric Industry Co. Ltd. recorded a handsome 19% increase in its information systems revenue, to ¥269.3 billion ($1.95 billion) for the year



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ending September 1989, due mainly to its expanding business in Japan's fast-growing financial industry. The banking and securities industry, the moneybags of the Japanese economy, traditionally has been Oki's main area of strength. The location of Oki's headquarters—in a Fuji Bank Ltd. building—symbolically underscores the strength and influence wielded by the firm's major shareholder. "The finance industry is our biggest source of IS revenues," confirms Masayoshi Yurugi, general manager of Oki's Information Systems Group.

Japan's highly profitable commercial banks, with huge nationwide branch networks, are constantly updating their computer systems and automated teller machines (ATMs). "Now they are in the middle of developing a fourth-generation on-line system," says Yurugi, and Oki plays a significant role in that development. Further deregulation of Tokyo financial markets—particularly retail banking—should result in more business for Oki, as banks, as well as securities and insurance companies, are likely to increase investments in computer systems and high-speed ATMs to face intensifying competition.

Although it manufactures Nihon Unisys Ltd.'s 2200-600 and -400 models, Oki does not produce mainframe computers. However, the firm has strong expertise in decentralized, midrange information systems. Fuji Bank, for instance, has installed Oki's systems at more than 300 of its retail branches throughout Japan. "It is no exaggeration to say that we could start a bank anytime. We may have more expertise in running a financial outlet than most bankers," says Yurugi. A good grasp of the financial business helps Oki win clients' confidence and design the system that best suits their needs. Applications, Yurugi emphasizes, are the key to the computer business today.

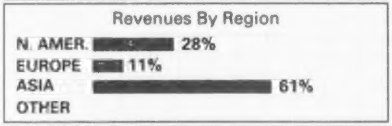
In the same market, sales of Oki's new, high-speed ATMs are skyrocketing; the company expects at least 10,000 units to be shipped this year. "We can't meet the demand," Yurugi says. Through an original equipment manufacturer (OEM) agreement with Sun Microsystems Inc. signed last May, Oki hopes to have access to some of Sun's wealth of financial software, which can be modified for the company's financial clients.

Oki is not a weakling in the laptop market, although it focuses its efforts on a higher income market sector than its competitors. The company has a magazine-sized laptop and plans to launch its sophisticated 32-bit model, the AX 30, by this summer. Aimed at corporate clients, the new laptop could be 50% more expensive than Toshiba Corp.'s 16-bit models. "We don't bother with massive [advertisements] because our clients are major corporations. Our products rarely appear at discount stores for this reason," concludes Yurugi. Indeed, that may well be Oki's major strength.

—Nobuko Hara

IS Revenues: $1.80 Billion

REGION **11** **RICOH** WORLD **33**


Revenues By Region

RICOH CO. LTD.
15-5 Minami-Aoyama 1-chome
Minato-ku, Tokyo 107, Japan
(81-3)-479-3111

Although in recent years Ricoh Co. Ltd.'s earnings have suffered from the effects of the high yen and trade friction, these factors were not in evidence in 1989. Ricoh's overall sales rose 18% to ¥811.4 billion ($5.9 billion) for the year ending September 1989, despite tough competition in the overseas facsimile market and an apparently saturated domestic copier market. The company posted a 12.2% increase in information systems revenues to ¥248.3 billion ($1.8 billion) last year. Net income rose 40% over calendar 1988 figures to ¥21.7 billion ($157.6 million).

Sales of facsimiles were flat last year, hard hit by rivals dumping lower end machines in the U.S. market. Sales volumes, however, were up over 10%. Having discussed with rivals Murata Manufacturing Co. Ltd. and Toshiba Corp. what it saw as unfair price cutting, Ricoh expects the pressure from them to abate gradually this year. Also, if demand in the United States and Europe remains strong, sales should return to a healthy 7 to 8% growth. Sales of group IV facsimile machines should increase in Japan as Nippon Telegraph and Telephone Corp. expands its Integrated Services Digital Network (ISDN) outside major metropolitan areas.

Despite maintenance problems reported last year with the LP6000 laser printer, sales of laser printers increased to the point where they constituted 60% of the company's ¥60.5 billion ($438.5 million) in sales of peripherals.

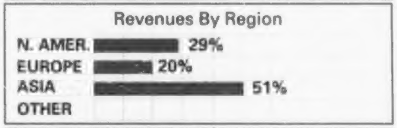
Ricoh continued its aggressive expansion into domestic information systems, selling Hitachi Ltd. PCs and IBM System/55s and System/36s on an original equipment manufacturer (OEM) basis and acting as a sales agent for NEC Corp. office computers. The OEM policy resulted in sales of office and personal computers of ¥17.4 billion ($126 million) and ¥22.3 billion ($161.5 million), respectively, for the year ending in September 1989. However, margins in this area remained a low 4% in 1989, well behind Canon Inc.'s 7% profit margins, the industry's highest. This is largely because Ricoh, unlike Canon, does not sell its own hardware. The use of OEM equipment has also complicated Ricoh's efforts to expand its IS business overseas because it increases the difficulty of addressing after-sale maintenance and software compatibility problems. The company has high hopes that its new optical disk filing systems, which employ 5- and 12-inch erasable disks, will further boost its office automation revenues in the coming year. Sales of optical equipment reached 5% of total sales last year.

Sales of copiers continue to make up 55% of Ricoh's office equipment sales, despite recent efforts to diversify into information systems. The 7% gain in copier sales was due in part to efforts to add value to existing products, which include the introduction of a digitalized intelligence system employing advanced digital technology.

—Stephen Lukow

IS Revenues: $1.45 Billion

REGION **12** **SEIKO EPSON** WORLD **40**


Revenues By Region

SEIKO EPSON CORP.
3-3-5 Owa, Suwa-shi
Nagano 392, Japan
(81-266)-52-3131

For Seiko Epson Corp., 1989 was a disappointing year, marked by a serious marketing setback in what has long been the company's major strength—laptop computers. Rival Toshiba Corp.'s huge success with Dynabook dealt a crushing blow to Epson's Note, which is functionally comparable to Toshiba's model but more than twice the price.

Launched almost concurrently with Dynabook and operating on two integrated circuit (IC) cards (128 bit and 640 bit), Note is slimmer and lighter than Toshiba's floppy disk-based product. "Our aim was to develop the world's slimmest computer to commemorate the 20th anniversary of the advent of quartz," explains Katsuyuki Kanuma, spokesman for Epson. "Note, which has a built-in communications system and uses a higher quality CPU [central processing unit], is far superior to Dynabook."

Superior technology notwithstanding, sales for Note did not even reach a third of the annual target of 10,000 units last year. But Dynabook surpassed its annual sales target in the first six months of 1989. "We disregarded commercial considerations in the product development," says Kanuma. Despite Note's commercial failure, the company managed to nudge its information systems revenues upward 5% to ¥200 billion ($1.4 billion).

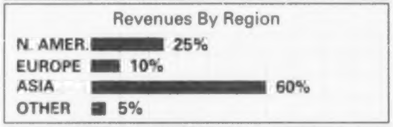
"This year it is our turn to fight back," says Kanuma, although the effects of continued Dynabook success can be felt even more strongly in 1990. To that end, in February, Epson came back with a laptop at exactly the same price as Toshiba's model. The new, cheaper Note operates on a floppy disk as well as an IC card, but is thicker and slightly heavier. Epson's first color laptop also should appear on the Japanese market by the middle of this year. Management had planned to launch the computer last year, but decided to delay until it had developed a mass production technology enabling the company to cut the price to less than ¥700,000 ($5,000). "We are not going to rush into it. We've got to time it right," says Kanuma.

Essentially a printer maker, Epson still commands the top share of the global mini-printer (a calculator-sized printer) market, with total output in 1988 exceeding 100 million units. Today, the company has manufacturing bases in France, the United Kingdom and West Germany and marketing bases in more than 21 countries. In April of this year, Epson established its European Community headquarters in the Netherlands. Until three years ago, exports constituted more than two-thirds of the company's annual revenues, but with the opening of overseas plants, the ratio has dropped to 50%. "The export ratio is likely to decrease even further," says Kanuma.

Would Epson consider tying up with a mainframe company such as Nihon Unisys Ltd. to broaden its product line in the face of ever-intensifying competition? "We're a very independent company, proud of its own technological developments. I don't think our management would even consider such an idea," snaps Kanuma. —*Nobuko Hara*

IS Revenues: $1.35 Billion

REGION **13** **C. ITOH** WORLD **42**



C. ITOH & CO. LTD.

5-1 Kita-aoyama 2-chome
Minato-ku, Tokyo 107-77, Japan
(81-3)-497-2121

As one of Japan's top trading companies, C. Itoh & Co. Ltd. is not a large presence in the information systems market. IS accounts for only about 1% of the company's total business.

In fact, the biggest story of C. Itoh's IS business—the sale of its wholly owned U.S. subsidiary, CIE Systems Inc.—resulted from a strategy aimed at expanding the company's satellite business and getting out of what it considers flat growth markets, such as business computers and services.

In January 1990, CIE was sold to General Automation Inc. of Anaheim, Calif., for $4 million. Irvine, Calif.-based CIE manufactures multiuser Motorola 68020- and 68030-based microcomputers, which run the Pick operating system, and sells them to value-added resellers (VARs) in Australia, Europe and the United States. Says Len Mackenzie, president and vice chairman of General Automation, "We're extremely satisfied with what we bought. The C. Itoh acquisition contributed quite nicely to the company's fifth consecutive quarter of profits."

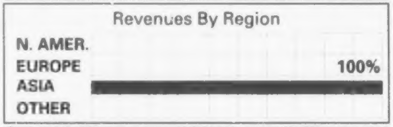
C. Itoh's IS sales grew 26% to ¥185.7 billion ($1.3 billion), continuing a similar rise in growth in the previous year.

In its computer business, C. Itoh primarily sells products made by other companies, such as 9- and 24-pin dot matrix and laser printers made by Tokyo Electron Ltd. In March, C. Itoh and Tokyo Electron entered a joint venture to sell such printers to major original equipment manufacturers (OEMs), including AT&T. C. Itoh's family also includes fault tolerant computers manufactured by Stratus Computer Inc. and workstations from Sun Microsystems Inc.

C. Itoh hopes to realize significant revenues from its aggressive foray into the mobile phone business, taking a 20% stake in a joint venture called Telesat Mobile Inc. of Ottawa. It has also invested in KDD, one of Japan's new long-distance phone companies, to build a network between the United States and Japan. —*Marcia Stepanek*

IS Revenues: $520 Million

REGION **14** **CSK** WORLD **72**



CSK GROUP

Shinjuku Sumitomo Building
6-1 Nishishinjuku 2-chome
Shinjuku-ku, Tokyo 163, Japan
(81-3)-344-1811

Value-added networking (VAN) figured prominently in CSK Group's continuing moves last year to diversify its computer services business. For instance, CSK established a new company called Nippon Regiphone Systems Corp. (NRS) to market Regiphone, its point-of-sale (POS) register terminal. Via Regiphone, users can maintain their application systems.

Another VAN affiliate of CSK, RSA Network Corp., installed an estimated 2,000 POS terminals from September 1988 to September 1989. That number is expected to reach 10,000 by the end of 1990. Furthermore, CSK expects its networking business to rise from 8 to 18% of revenues by the year 2000. "The VAN side isn't bleeding them to death," comments one analyst, who estimates that to date, CSK has already recovered half of the ¥20 billion ($145 million) it has invested in its seven VAN subsidiaries.

Nevertheless, with 57% of its computer service revenues coming from software development in the year ending in

September 1989, the company will remain reliant on those capabilities for the near future. CSK's margins in that area remained a little better than the industry average at 6 to 7%. Manufacturing and financial industries made up 35% and 31% of software development revenues, respectively.

The stress the company's founder, Isao Okawa, places on educating employees may give the company an edge against its big rivals, as the most severe problem in the Japanese software industry is keeping customers from hiring away software developers. To that end, CSK put 850 new employees through a six-month course in specialized system engineering and knowledge engineering at its new CSK Computer and Information Education Center.

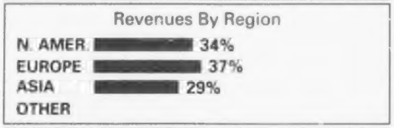
For the period from September 1988 to September 1989, CSK's total revenues were ¥71.8 billion ($520 million), a 20% increase over the same period in the year before. CSK has experienced strong growth in the steel and electrical appliance markets, as well as increased demand from distribution companies. CSK expects more of its business to come from the distribution sector, which lags behind the manufacturing and services sectors in its degree of computerization.

CSK's computer hardware sales rose 15% to ¥17 billion ($123 million), reflecting an increase in sales of small- to medium-sized computers. Major developments in this area included CSK's second joint venture with IBM Japan, called CSI Corp. Ltd., which will develop, market and support IBM systems coupled with CSK-designed software. *—Stephen Lukow*

IS Revenues: $493.7 Million

REGION **15** — **ACER** — WORLD **75**

Revenues By Region



ACER INC.
602 Min Sheng East Road
Taipei 10445, Taiwan
(886-2)-718-2349

Last year was another record-breaking year for Acer Inc., the Taiwanese company that until now has focused its efforts on high-end personal computers. Acer's calendar 1989 IS sales reached NT$13 billion ($494.7 million), and with the production of its one millionth PC, the company topped even its own ambitious targets. But the year was important for another reason: Acer's ebullient chairman and chief executive officer, Stan Shih, devised a new strategy that is intended to serve the new company throughout the nineties.

Globalization will be Acer's main thrust in the next decade, as it adds sales offices around the world. The new strategy also envisions a major diversification for the company in three directions: software, semiconductors and networking. Recognizing that hardware is rapidly becoming a commodity product, Shih wants to position the company as a major software supplier, particularly for the Chinese business community which dominates the economic activity of Southeast Asia. With this goal in mind, Shih hired Leonard Liu last year as president of Acer. Liu, who had been general manager of IBM's Santa Theresa, Calif., software development laboratory, was a 20-year veteran with Big Blue.

Acer's new focus on the Southeast Asian market underscores the region's continued rapid growth rate—at a time when European and U.S. market growth is slowing down—and the renewed interest in running computers, particularly PCs, in local languages.

Acer is already the largest software distributor in Taiwan, acting as the exclusive distributor there for Microsoft Corp. and Ashton-Tate Corp. The company has participated in the development of a Chinese version of MS-DOS in cooperation with Microsoft and has introduced a Chinese version of Ashton-Tate's dBASE III. Acer also added to its software stable last year by acquiring Princeton Publishing Labs Inc., a New Jersey-based developer of desktop-publishing software.

By establishing a joint venture with Texas Instruments Inc. to manufacture 1- and 4-megabit dynamic random access memories (DRAMs) in Taiwan, Acer is assuring itself a supply of these critical components. But because memory prices tend to ride a roller coaster, this may be one of Acer's riskier investments. In the new venture, Acer will own 74% of a $250 million manufacturing facility, the only one of its kind in Taiwan. Acer has also concluded agreements with National Semiconductor Corp. whereby the two companies will jointly develop very large scale integrated (VLSI) chips and National will market chip sets designed by Acer.

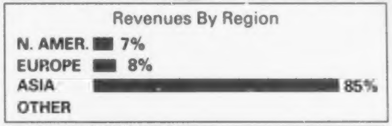
To cash in on the trend to network PCs, Acer has set up a new business unit called Network Computing Business, which will supply integrated network computing solutions. The new unit will report to Liu, who once was group director of communications and programming at IBM.

—Lew Young

IS Revenues: $420.4 Million

REGION **16** — **ALPS** — WORLD **86**

Revenues By Region



ALPS ELECTRIC CO. LTD.
1-7 Yukigaya ohtsuka-cho
Ohta-ku, Tokyo 145, Japan
(81-3)-726-1211

A drain on profitability continued at Alps Electric Co. Ltd. in 1989, largely due to the Tokyo stock market crunch, lowered export values and higher overseas operating costs caused by unfavorable foreign exchange rates and continued price cuts demanded by customers in Japan and abroad.

Consolidated corporate revenues for the fiscal year ending in March 1990, including all Alps subsidiaries, were up 6% to ¥400 billion ($2.9 billion). Revenues for the parent company alone were up slightly, by an estimated 3% to ¥315 billion ($2.3 billion). Although operating profits at the parent company, fueled by the stronger dollar, increased by 52% to ¥10 billion ($72.4 million), net profits were down about 16% to ¥5.1 billion ($3.71 million) according to securities analysts. The story was worse at Alps' subsidiaries, where profits were pummeled, according to investor bulletins issued in May. Compared with calendar 1988 figures, consolidated net income for all of Alps, both parent company and subsidiaries, plummeted nearly 91%, from ¥5.5 billion ($42.9 million) to ¥500,000 ($3.6 million).

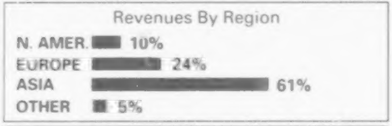
Substantial losses were incurred at Alps' Tohoku, Japan, floppy disk drive subsidiary, California-based Alps Electric (USA) Inc. Market analysts blamed those losses on price-cutting pressures fed by the stronger dollar. Alps' Korean subsidiary also suffered, mostly due to rising domestic costs fueled by the appreciation of the Korean won.

To help compensate, the firm has been expanding its European operations, boosting manufacturing capability for various electronic components. It was through such components that Alps first entered the information-processing business, and the company's strengths continue to lie in that area. In the United Kingdom, it boosted its videocassette recorder (VCR) components business and last August opened a ¥3.4 billion ($25 million) plant in West Germany to make heads for audio equipment.

While it's obvious that Alps' printer and peripherals business has not proven profitable, the company continues to be the world's largest independent supplier of floppy disk drives and commands a 60% share of the world's power switch market. It also continues to supply keyboards to IBM and other top PC makers. *—Marcia Stepanek*

IS Revenues: $380 Million

REGION **17** **MITAC** WORLD **94**



MITAC INTERNATIONAL CORP.

585 Ming Sheng East Road, Eighth Floor
Taipei, Taiwan
(886-2)-501-8231

Mitac International Corp. is the second Taiwanese computer company (Acer Inc. was the first) to have broken away from the country's heretofore typical pattern of cloning other companies' products and selling them as cheap copies. The change in marketing strategy for Mitac and others is largely the result of a conscious, unified movement on the part of Taiwanese industrialists to get brand name recognition for their products worldwide.

Indeed, computers bearing Republic of China company names have spread throughout Asia and much of the rest of the world. In achieving this marketing change, Mitac, like Acer, has focused on the high-performance end of the personal computer market. In calendar 1989, Mitac's personal computer sales grew 25% to NT$4.7 billion ($178.6 million) as the company aggressively marketed its small footprint desktop machines built around Intel Corp.'s 80286 microprocessor and introduced new high-performance units and engineering workstations built around the 80386 and 80486 microprocessors. Of the company's total 1989 PC sales, 60% were brand name sales, up from 55% in 1988. Nearly 75% of Mitac's sales growth in PCs came from the increased number of its brand name computers in the market.

Sales for the Mitac Group, which includes the computer company, last year grew 49% to NT$10 billion ($380 million).

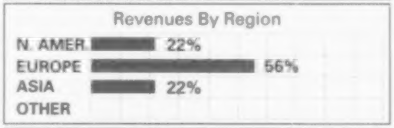
It is no coincidence that Mitac concentrated on machines with Intel microprocessors at their heart. The company started in business in 1974 as the Taiwanese distributor for Intel semiconductors, and it still acts in that capacity. Matthew F.C. Miau, Mitac's chairman and cofounder, had been a product design manager at Intel in California before he helped set up Mitac in Taipei.

Miau also has set the company on a track of diversification. In 1990, Mitac will begin production of its first laptop computer. A new company, Micro Integrated Communications Corp., has been established in the United States to develop the company's capabilities in communications. Mitac's purchase of 12% of Wyse Technology last year was also a part of this diversification.

In eyeing its information technology future, Mitac closely scrutinizes the moves of its most bitter rival, Acer. Maybe not coincidentally, the headquarters of the two companies are located only two blocks apart on Taipei's busy Ming Sheng East Road. *—Lewis H. Young*

IS Revenues: $366.4 Million

REGION **18** **KYOCERA** WORLD **97**



KYOCERA CORP.

5-22 Kitainoue-cho Higashino
Yamashina-ku, Kyoto 607, Japan
(81-75)-592-3851

1989 was a landmark year for Kyocera Corp., the world's largest manufacturer of integrated circuit (IC) ceramic packages. The company made two major overseas investments designed to reduce its dependence on its mainstay ceramics business and place increased emphasis on data communications and electronic parts and components. The moves were also seen as a way to recover from a downturn in earnings in the second half of the year caused by reduced semiconductor demand in the United States.

In late July, Kyocera bought California-based electronics parts maker Elco Corp. for $250 million, giving the firm full control of a number of Elco companies in various countries, including Japan, South Korea, the United Kingdom and West Germany. At the end of September, Kyocera bought another U.S. electronics parts maker, AVX Corp., for stock valued at $561 million. Kyocera says the buyout of AVX—which has a strong manufacturing presence in Europe—was aimed at giving the company a production foothold in Europe in preparation for the 1992 European Community market integration.

The new emphasis on electronic equipment is in keeping with chairman Kazuo Inamori's principle of keeping innovation within the company. Three years ago, this part of the company was in the red, but it now accounts for 10% of the firm's profits. Revenues for information systems, which were ¥50.6 billion ($366.4 million) in fiscal 1989 (ending March 31, 1990) currently represent only about 15% of Kyocera's overall sales of ¥339 billion ($2.5 billion), but the company hopes to greatly enlarge that share.

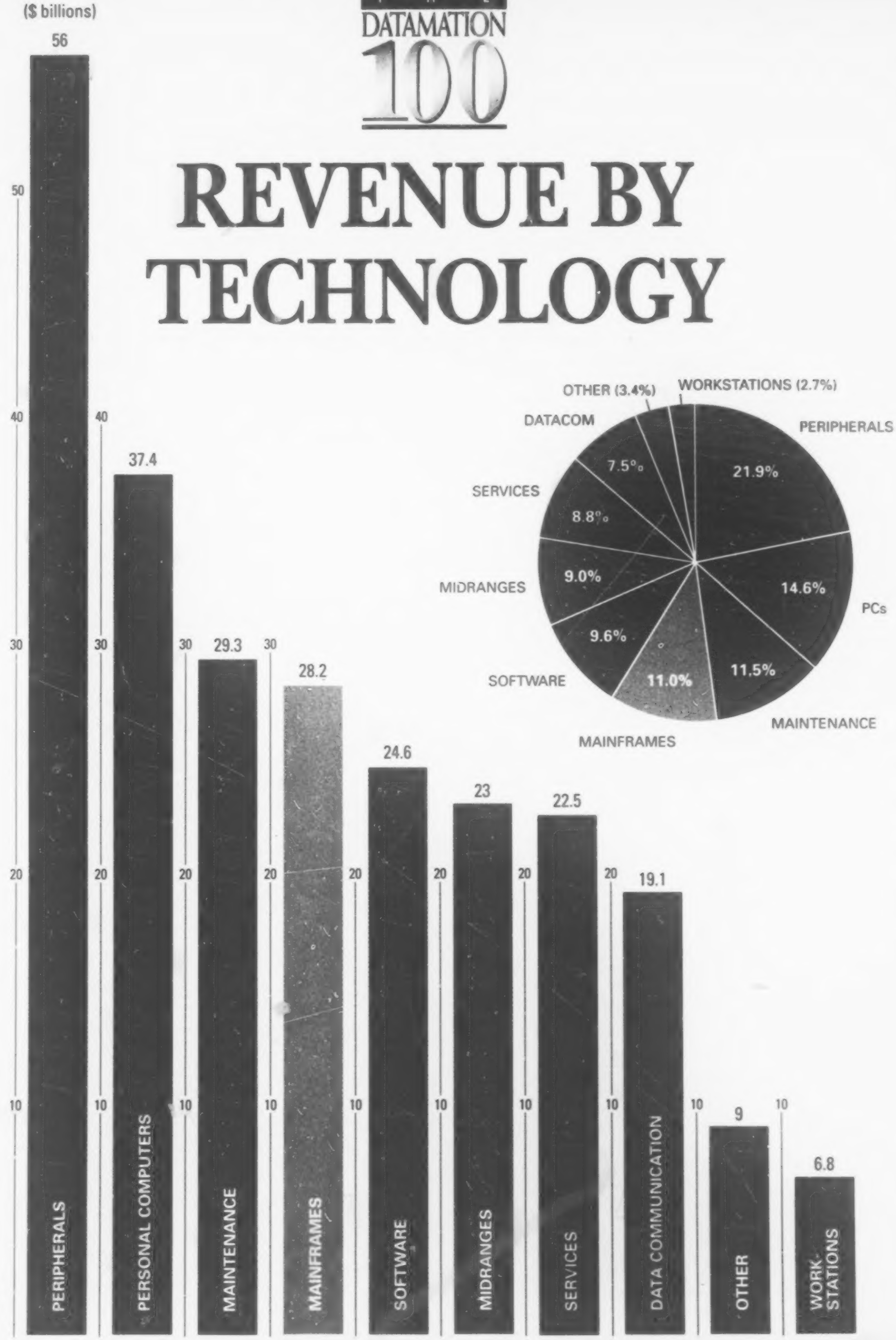
Having targeted PCs as one of the main growth areas, the company in 1989 introduced 16- and 32-bit versions of its 80386-based AX PC series. Sales of the 40-megabyte desktop units, which went on the market in October, have so far not been strong, but Kyocera is undaunted and plans to release a 100MB 32-bit model in the near future. However, 80% of Kyocera's PC sales are still original equipment manufacturer (OEM) units sold in Europe.

Sales of the company's other main IS product, laser printers, do remain strong. Most of these printers are sold in the European market. Last year, Kyocera introduced three new laser printer models and plans to market them both domestically and overseas.

In personnel news, executive vice president Kensuke Ito was promoted to the company's presidency, replacing Kinju Anjo, who will become one of two vice chairmen. *—Steve McClure*

THE DATAMATION 100

REVENUE BY TECHNOLOGY



Desktop Systems Become Network Stars

More sophisticated servers, early OS/2 applications and the spread of networked machines marked events in personal computing in 1989.

BY JOHN O. DUNKLE

With more networks sinking deeper into companies of every type and stripe, the personal computer became more of an interpersonal tool in 1989. In fact, by the end of the decade, just over 65% of the PCs found within the office environment were connected. This trend will continue to gain momentum as over 82% of the PCs within organizations are expected to be networked within the next two years.

But, to fully appreciate 1989, one must revisit predictions that were made at the end of 1988, when the promise of OS/2 was still fresh in users' minds.

It was predicted that graphical user interface (GUI) standards would allow applications for different operating systems to achieve a high level of commonality. Industry pundits were touting the benefits of "groupware," even though a definition didn't exist. IBM's proprietary Micro Channel bus architecture would soon fall victim to the Extended Industry Standard Architecture (EISA), a rival bus being peddled by Compaq Computer Corp. and eight other companies, the so-called Gang of Nine. Apple devotees would be able to purchase a low-cost Macintosh priced at less than $1,000. And, finally, Steve Jobs would blow the doors off the industry with the NeXT machine.

486-based PCs are slow to catch on.

So much for predictions. The promise that OS/2 brings to the personal computer market is still waiting to be fulfilled. The graphical user interface standard doesn't exist. Groupware remains undefined. Micro Channel gained in market share, and the industry was left waiting for the general availability of EISA-based products. The low-cost Mac has yet to arrive. And, finally, users are waiting for the NeXT product from Jobs' company, NeXT Inc.

However, several important developments occurred or continued to unfold in 1989. Compaq introduced the SystemPRO, the first tightly coupled symmetrical multiprocessing server available. Apple Computer Inc. brought out its long-awaited portable. The first OS/2 applications began to appear on dealers' shelves. Application developers and companies producing operating systems for local area networks took an enterprisewide approach to the integration of work groups and PC-based applications. Vendors reevaluated and committed to a long-term personal computer strategy for embracing a robust distributed-computing model. All in all, 1989 was an exciting year in the development of technology.

In products, however, 1989 was somewhat of a disappointing year for users expecting next-generation PS/2 machines from IBM. Despite the introduction by IBM of the i486-based PS/2 PowerPlatform card, there weren't any new dedicated high-end products for users who needed to upgrade personal computers beyond 286/386 performance. This left a void that Compaq, Dell Computer Corp., Hewlett-Packard Co. and others were all too willing to fill. However, in the latter part of 1989, IBM did issue a statement of direction with regard to the incorporation, beginning this year, of its next-generation Micro Channel Architecture in PS/2 products. This statement covered faster bus speeds, transfer rates and system throughput.

The year was also marked by:

- **Shorter product life cycles.** PC product life cycles shrunk to just over two years, compared with the previous five years. This time compression demonstrates how quickly technology at the PC level is evolving. Hardly had the 80386-based PCs captured the attention of the market in 1989 than users were evaluating several products based upon the i486.
- **Buying hesitation.** Managers responsible for PC purchases evaluated a wide span of PC technologies, including high-performance products suitable as servers and lower cost PCs for more traditional applications. However, user organizations' ability to absorb newer generations of technology as rapidly as the technology was being pumped out by vendors became questionable. Sales of 80286-based PCs outstripped antiquated 8088-based systems in 1989, but 286 sales also far outstripped those of the more powerful 386 and

The ABCs of PCs

Overall, the PC industry showed signs of maturity in 1989.

- Product life cycles shorten to just over two years, compared with five years previously.
- PC buyers hesitate on new purchases, as vendors pump out more new technology, such as 386- and 486-based PCs, than users can absorb.
- Competition among thinning ranks of vendors increases, as market dollar growth slows to 13%.
- Networking of PCs increases as better peer-to-peer communications capabilities become available.

Source: WorkGroup Technologies

The Top 10 in PCs

With the acquisition of Zenith Data Systems, Groupe Bull is now a major player in PCs.

	DTM 100 RANK	COMPANY	PC REVENUES 1989 ($MIL.)	PC REVENUES 1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	8,343.0	7,150.0	16.7%	22.3%
2	11	Apple	3,574.2	2,950.0	21.2%	9.6%
3	3	NEC	3,116.5	2,492.3	25.0%	8.3%
4	16	Compaq	2,876.1	2,065.6	39.2%	7.7%
5	8	Groupe Bull	1,681.0	318.0	428.6%	4.5%
6	10	Olivetti	1,523.4	1,427.5	6.7%	4.1%
7	13	Toshiba	1,340.8	1,083.4	23.8%	3.6%
8	31	Tandy	1,330.0	1,232.2	7.9%	3.6%
9	5	Unisys	1,300.0	1,050.0	23.8%	3.5%
10	4	Fujitsu	869.7	829.4	4.9%	2.3%

* Percentage share of DTM 100 revenues

Data General steps toward open systems with Aviion.

486 offerings.

- **Competition.** PC market growth in dollar terms sagged to an industry all-time low of 13%, according to WorkGroup Technologies of Hampton, N.H., adversely affecting many major computer manufacturers and small PC dealers. The entry-level price for a new 286-based system fell well below the $1,000 threshold and even new 80386SX-based products were offered at a street price under $2,000. The price competition, among other factors, caused many vendors to slash their 1989 earning expectations as early as May, chop employee ranks and downsize operations and programs—and those manufacturers were the lucky ones. The less fortunate were either acquired or faded quickly out of view.

The Top 10 in Workstations

Buying Apollo made Hewlett-Packard No. 3 in workstations.

	DTM 100 RANK	COMPANY	WORKSTATION REVENUES 1989 ($MIL.)	1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	27	Sun	1,443.8	1,096.2	31.7%	21.3%
2	2	Digital	1,195.0	700.0	70.7%	17.6%
3	7	HP	825.0	438.0	88.4%	12.2%
4	15	Matsushita	800.9	N/A		11.8%
5	1	IBM	591.0	552.0	7.1%	8.7%
6	42	C. Itoh	471.1	N/A		6.9%
7	20	Xerox	325.0	400.0	-18.8%	4.8%
8	52	Intergraph	260.0	150.0	73.3%	3.8%
9	6	Hitachi	181.2	N/A		2.7%
10	22	STC	114.5	N/A		1.7%

* Percentage share of DTM 100 revenues
N/A= Not Applicable

- **Connectivity.** The trend of moving corporate computing away from the dedicated mainframe environment continued. Corporate information became increasingly produced by and maintained in multiple work groups throughout the organization. For this reason, the traditional PC, midrange and mainframe environments have changed substantially.

Midrange systems continued to evolve into line of business computers, acting as file repositories for their own cluster and as a server when communicating to other work groups. This peer-to-peer communication capability is becoming the foundation of the successful implementation of servers in multiple-domain, enterprisewide work groups. The centralized mainframe environment continued to evolve toward enterprise network management.

What's Coming Up?

Operating systems supporting multiuser distributed applications are now being closely scrutinized by most IS executives. According to WorkGroup Technologies, in 1989, over 65% of IS managers evaluated UNIX and most also evaluated OS/2 Extended Edition. The fundamental difference between UNIX and OS/2 is that UNIX is an application development environment and OS/2 is an application-processing environment. Today, far more applications are available under UNIX than OS/2. WorkGroup expects this trend to continue through 1990. Applications that take advantage of all the features that OS/2 Extended Edition provides will not be widely distributed until 1991.

WorkGroup also expects that GUIs like Microsoft Windows, OS/2 Presentation Manager, the Open Software Foundation's Motif interface, and UNIX International Inc.'s Open Look will become the major forces driving rapid customer acceptance of PC and workstation operating systems. And the ease of use provided by GUIs will foster the rapid development of compound documents. Compound documents let users combine text, images and graphics into a single file. We expect compound documents to become the communications medium for tomorrow's corporate information systems.

Compaq's SystemPRO is introduced.

But due to the large file size of a single compound document, enterprise communications capabilities will be pushed to the limit. In preparation for this, IBM has increased the capabilities of its Token Ring from 4 megabits per second to 16Mbs. We expect to see other vendors following IBM's lead in the near future.

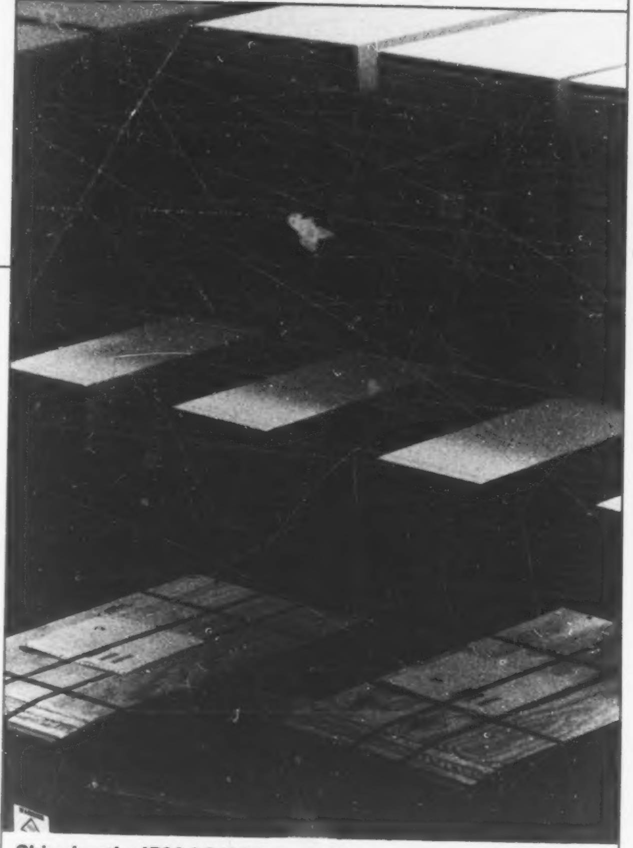
John O. Dunkle is vice president, work group computing, of WorkGroup Technologies in Hampton, N.H.

MIDRANGE

Two Markets, Many Challenges

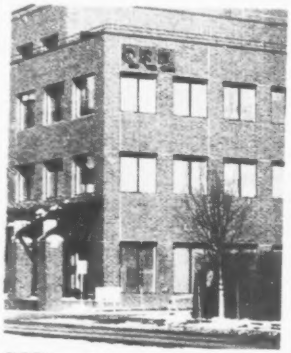
Last year's trends set the stage for the drama that will be played out in the 1990s, when the midrange market splits in two.

BY STEPHANIE JOHNSON AND PAUL ZORFASS



Shipping the IBM AS/400 to a LAN near you.

The midrange market has been buffeted by change ever since Digital Equipment Corp. first began churning out computer processors from its converted Civil War mill in Maynard, Mass., back in the late 1950s. The greatest and most turbulent period of change, however, is expected in the mid-1990s, when the market is destined to split into two disparate segments, the midrangers North and South.



OSF headquarters: Waging warfare over UNIX.

Taking the slower and lower road to the South will be vendors offering wares that war with low-end PCs and workstations. Taking the high road to the North will be stronger forces offering local area and wide area network server platforms, along with other departmental and networked-computing schemes.

While this division of the market is no Civil War of computing, it will nevertheless result in dramatic distinctions, some of which were clearly perceptible last year. In 1989, the midrange experienced reasonable growth, generating revenues of some $28 billion. Within the next several years, the Yankee Group predicts that this growth will be running within the range of 7 to 9%.

At the top of the trends fueling that growth in 1989 was UNIX. AT&T's System V release 4 V.4 promises to make everyone's life easier, particularly midrange vendors. Now, at least, they have a realistic target against which to compare their own UNIX versions (Hewlett-PackardCo.'s HP-UX and Digital's UL-TRIX, for example).

Roaming the Midrange

The market begins to split as vendors compete at the low end against PCs and workstations and at the high end in the LAN/WAN server markets.

- AT&T unveils release 4 of UNIX System V, which expands the role of UNIX from merely an operating system to an open environment.
- RISC moves into the midrange mainstream.
- OSF announces its Motif graphical user interface; Digital works on a GUI for its midrange servers.
- The proliferation of PC LANs eats at the midrange market, but also opens up opportunity for midrange services in client/server configurations.
- Midrange systems continue to dominate in the image-processing application arena.

Source: Yankee Group

The most important thing about System V release 4 is that it changes the whole concept of UNIX. No longer can UNIX be viewed as only an operating system. Now with V.4, the software evolves into an actual operating environment. UNIX International Inc.'s announcement of environment enhancements earlier this year reinforced this environmental image.

The UNIX battles, however, are still not over. OSF/1, the Open Software Foundation's answer to V.4, has yet to be unleashed. But the decision that users will eventually make about which UNIX to use will hinge less on technology and more on other pragmatic considerations. In weighing those considerations, they'll be opting for the UNIX system that offers the best tools and techniques to create an open environment to protect their software investments, to reduce vendor dependence and to lower integrations costs.

RISC in the Mainstream

Last year, one technology that really moved into the mainstream of the midrange market was reduced instruction set computing (RISC). HP was the first midranger to run with RISC, incorporating the technology into its Precision Architecture. Next, Data General Corp. entered the RISC race with its Aviion system, which is built on the 88000 RISC chip from Motorola Inc.

Several months later in July, mighty middie Digital announced that it was offering RISC on its 5000 series DECsystems. The Massachusetts manufacturer, which had already made its RISC

The Top 10 in Midrange

IBM's AS/400 and Tandem's OLTP machines were bright spots in a desultory year for the midrange.

	DTM 100 RANK	COMPANY	MIDRANGE REVENUES 1989 ($MIL.)	MIDRANGE REVENUES 1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	6,753.0	4,400.0	53.5%	29.4%
2	2	Digital	2,670.0	2,981.5	-10.4%	11.6%
3	3	NEC	1,471.3	1,447.5	1.6%	6.4%
4	4	Fujitsu	1,304.6	1,225.2	6.5%	5.7%
5	5	Unisys	1,122.0	1,080.0	3.9%	4.9%
6	13	Toshiba	978.4	1,092.1	-10.4%	4.3%
7	7	HP	750.0	750.0	0.0%	3.3%
8	37	Tandem	709.6	557.0	27.4%	3.1%
9	10	Olivetti	607.0	614.3	-1.2%	2.6%
10	21	Wang	570.0	912.1	-37.5%	2.5%

* Percentage share of DTM 100 revenues

move on the workstation front in January, was clearly signaling its commitment to the technology for its midrange systems. It was also signaling its willingness to bring in outside technology: in this case, the RISC muscle came from MIPS Computer Systems Inc., in which Digital holds around a 5% equity stake.

Digital was also active last year in the key area of graphical user interfaces (GUIs). For the past three years, all of the major midrange vendors have been working on these front-end environments, which promise to open the door to more effective end-user computing.

OSF gave the GUI movement a major push when it announced last year that it would begin shipping in August its Motif GUI, which is built on component software from Digital, HP and Microsoft Corp. The windowing facility in DECwindows will eventually enable Digital to support multiple desktop environments using a midrange server. The same type of support will also be available for HP's NewWave windowing facility.

The base layer in these support environments is the X Window System. Developed at the Massachusetts Institute of Technology, X Windows features an object-oriented approach to software components and information. The X Windows standard has in fact provided a rallying point for advocates of object-oriented products. Still, object-oriented software techniques have yet to make major inroads in the midrange, inroads that have already been achieved in the PC market.

An increasing number of PCs were deployed last year in local area network schemes. In the LAN arena, PCs are clearly a threat to midrange machines. But they also represent an opportunity for those midrange systems that are tailored around a client/server architecture. Operating as a server in a PC LAN management role, IBM AS/400s or Digital MicroVAXs can quite easily provide application, system and programming services.

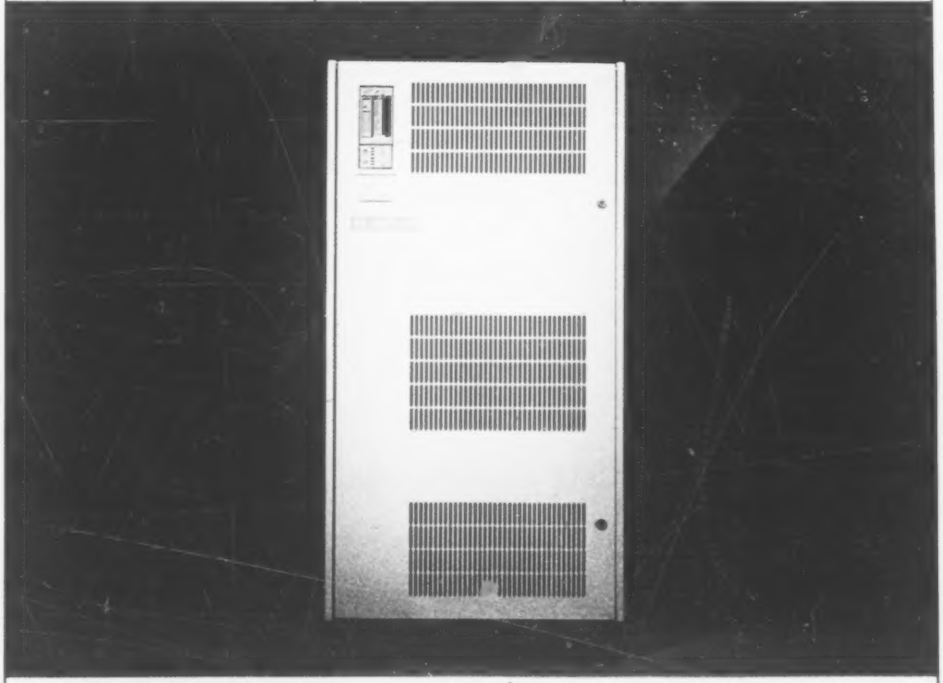
At Your Service

This server role for midrangers was already in evidence last year. After all, midrange systems are proving to be robust and reliable servers and platforms. And robustness and reliability are especially important when it comes to on-line transaction processing (OLTP). In fact, it's the fault-tolerant features of midrange machines that make them more attractive than PCs for OLTP applications.

An increasing number of these OLTP applications are distributed, a trend that is well served by midrangers. Nevertheless, client/server OLTP based on PCs or workstations is coming into computing vogue. So, to stay in fashion, midrangers will have to make sure their distributed OLTP approaches are compatible with popular PC LANs.

One application area that midrange systems continued to dominate last year was image processing. This strong position should stand midrangers in good stead in the years ahead. By 1992, the market for image processing and storage, which is valued at $500 million today, is expected to explode to $2.5 billion.

Stephanie Johnson is general manager of the Yankee Group in Boston. Paul Zorfass is senior director of computer research at the Yankee Group.



Now serving: Digitals VAX 6000.

MAINFRAMES

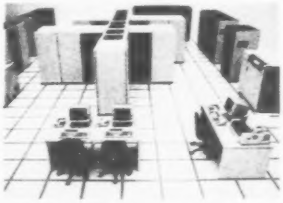
The Age of the POWERframe Is Here

Large scale corporate systems are ending one era and beginning another.

BY JOSEPH PAYNE

In 1989, the mainframe died. In its place, the POWERframe was born—the high end in a trio of new computing architectures to emerge for the 1990s.

The birth of a new generation of large scale corporate systems last year propelled the market, including peripherals, to $20 billion—10% higher than the previous year. That's exceptionally healthy given that it's harder to grow big markets than small ones and given the amount of discounting on old-generation mainframes in the market during the year.



IBM is still the strongest POWERframe player of all.

But what's driving such growth? What factors brought an end to the 25-year-long super product cycle of the mainframe as we knew it? And what is likely to follow? The answers all revolve around standardization embedded into and deliverable in system software form.

The Old and the New

The mainframe was *main* because it was the central point of residence of shared logic—the host. It was the first to use punch cards, then teletypes and finally terminals. This now obsolete host was a computer—usually a very big one—surrounded by its users, numbering hundreds or even thousands. Bigger need was satisfied by getting a bigger computer.

For most of the past 25 years, that time-sharing-based paradigm served as the single notion of what computing should be. But, in the latter years of that supercycle, the typical organization's deployment of computing changed. Increasing numbers of users traded in dumb input for smart input—i.e., swapping terminals for PCs.

Building on the notion of a framework that could accommodate much more smart input, a new product supercycle has begun that can be seen as a hierarchy of frames. Here are their classes:

- **POWERframes.** Characterized by the ability to interface with different forms of databases, these machines have parallel processors sharing an organizationally common memory and storage hierarchy. Their chief task is to regulate the flow of traffic into and out of those databases over a parallel access input/output structure called channel architecture. Their hallmark, beyond extraordinarily high instruction execution rates, is enormous communications bandwidth—giving them the ability to move massive amounts of data throughout any user organization.
- **SERVERframes.** Unique in their ability to serve up a locally shared database to a work group or a single user, these machines also can access organizationally collective databases.
- **CLIENTframes.** Home of all new applications and all human interface features, these machines eventually will allow users to automatically generate their own applications.

In the real world of organizationally adaptive computing architectures, the structure of a useful system of processing frames is bilevel. One level of this two-tier architecture is database automation; that's where you will find POWERframes. The other is office automation; that's where SERVERframes and CLIENTframes fit. Each level has a plethora of horizontal applications, intertwined by many webs of vertical applications.

None of the foregoing is really that much different than anybody else's view of the new computing system paradigm. But looking at large scale systems within this particular framework can make a few things clear. First, the thoroughly useless label known as "mainframe" should finally be laid to rest. Second, the eminently useful class of systems, POWERframes, was extremely strong in 1989 and should continue to be so in the 1990s. Third, the strongest POWERframe player of all, IBM, continues to define the class.

Tandem swirls into competition with Cyclone.

IBM Is Still the Market

IBM's very large share of the commercial high-performance computing market—at least six times that of any other single competitor—ensures that its system software is universally accepted as the de facto standard. This position is strengthened by a continuing rollout of software products by IBM and independent developers that comply with IBM's computing blueprint known as Systems Application Architecture (SAA).

The strength of the IBM operating system compatible (IBM-OSC) POWERframe market is undeniable. Last year, IBM's POWERframe (computer only) revenues increased 12% to more than $12 billion even

The Main Events in Corporate Systems

Being compatible with or competing against IBM was the name of the game.

- Hitachi Data Systems, a company owned by Hitachi and Electronic Data Systems, is born out of the remains of National Advanced Systems.
- Fujitsu introduces its MSP-EX operating system, aimed at boosting IBM compatibility, and later announces that it will export the MSP-EX system to West Germany's Siemens on an OEM basis, the first time a Japanese computer company has sold operating systems outside Japan.
- Amdahl announces the availability of ESA/370 and MVS/ESA on its 5990 series of mainframes.
- IBM unveils 16 J and J/H models of 3090, along with an extension of ESA.
- Digital and Tandem enter the mainframe market with the VAX 9000 and Cyclone products, respectively.

Source: Alex. Brown & Sons Inc., Cowen & Co., DATAMATION.

after the debilitating effects of currency translation adjustments. In local Western European currencies, IBM's POWERframe revenues may actually have expanded by as much as 25%.

Add to IBM's results those of Amdahl Corp. and Hitachi Data Systems Corp. for a full IBM-OSC market profile. Amdahl's processor and storage revenues totaled $1.65 billion, Hitachi Data Systems some $500 million. The collective IBM-OSC POWERframe market picture for 1989 was clearly one of expanding size and strength.

The big story of 1989 was the substantial increase in the number of IBM-OSC POWERframe users that have embraced IBM's Enterprise Systems Architecture (ESA) extension of its MVS operating system. The market currently available to run MVS/ESA represents half of the installed base of high-performance IBM-OSC computing systems. The other half is either loyal fans of VM or DOS/VSE variants or those that have not yet upgraded to ESA-qualified hardware.

IBM experienced stunning growth of its ESA licenses in 1989, from slightly more than 15% of the available market at the end of 1988 to more than 50% at the end of 1989. As much as 40% of the installed Amdahl market also moved up to ESA. IBM indicates that an ESA version of its VM operating system is on the way. And it has identified DOS/VSE as a strategic product because it can be controlled, distributed and downloaded from ESA/MVS sites.

Digital steps into the ring with the VAX 9000.

Driving demand for ESA, and the POWERframes needed to run it, are the capabilities of the architecture itself and the forces of distributed computing. ESA can manage memory and channel architectures much more efficiently than could previous generations of operating systems, practically automating the management of storage.

The Top in Large Scale Systems

IBM continues to lead the market—in revenues and technology.

	DTM 100 RANK	COMPANY	MAINFRAME REVENUES 1989 ($MIL.)	MAINFRAME REVENUES 1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	12,509.0	12,138.8	3.0%	44.4%
2	4	Fujitsu	3,261.5	3,248.5	0.4%	11.6%
3	6	Hitachi	3,116.5	2,897.5	7.6%	11.1%
4	3	NEC	2,391.8	2,394.4	-0.1%	8.5%
5	26	Amdahl	1,470.8	1,225.2	20.0%	5.2%
6	5	Unisys	1,200.0	1,175.0	2.1%	4.3%
7	8	Groupe Bull	840.5	901.0	-6.7%	3.0%
8	56	Cray	633.6	632.9	0.1%	2.2%
9	9	Siemens	611.7	683.4	-10.5%	2.2%
10	22	STC	466.1	658.4	-29.2%	1.7%

* Percentage share of DTM 100 revenues

Source: DATAMATION.

Source: DATAMATION.

Power and Price

The processing punch of POWERframes lies underneath an organization's computing environment, a fact that obscures the importance of this market. Aimed at automating databases and everything else that moving data around an organization requires—memory, storage and input/output channel management—end users are far removed from such power. The MIPS muscle of CLIENTframes, in contrast, lies right in front of users. The millions of instructions executed per second by workstations are focused on the screen, making applications user friendly and making this market segment seem overly important.

Punch and *price* were the operative words in the market in 1989. Amdahl raised the stakes of the MIPS ratings contest with its 5990 mainframe system, which began to be shipped last year. It is 50% more powerful than its IBM 3090 counterpart. Hitachi Data Systems attracted attention merely with the rumor of Andromeda, a machine speculated to be even 40% more powerful than the Amdahl machine.

Look for announcements like Andromeda by the end of this year and for shipments of 40 to 50MIPS processors from Hitachi and others to be commonplace by the end of 1991. Configurations of up to six or eight processors, at those processor performance levels, sharing truly awesome main memory and storage spaces, will define high-end POWERframe systems. Naturally, questions arise: What will users do with 240 to 400MIPS per system? Answer—move data. More significant might be the question: How much will that cost?

POWERframes of the next supercycle will enter the market at $50,000 to $75,000 per MIPS. Asking prices of $15 million to $20 million per machine will be common.

Also look for more competition in POWERframe-based computing in the future. Two new entrants in 1989 brought early technology to this market segment. Digital Equipment Corp. and Tandem Computers Inc. came to market with the industry's first POWERframe superscalar design implementations. A superscalar architecture executes more than one instruction per processor cycle.

What About the Others?

Tandem and Digital are the two leading non-IBM-OSC vendors that strengthened their competitive positions by moving up into the POWERframe market in 1989. But the POWERframe market for the most part was also good for Bull HN, Control Data Corp., Fujitsu Ltd., Hitachi Ltd., Siemens AG, STC PLC and Unisys Corp. Amazing, you say? Overall, the entire POWERframe installed base in 1989 generated revenues of $20 billion, up an estimated 10% That is big growth for such a big base.

There were, however, cross currents within the non-IBM-OSC market. Unisys did reasonably well with its model 2200 large-scale systems, upgrading customers that had purchased model 1100 systems when they were marketed by Sperry Corp. before merging with Burroughs Corp. to form Unisys. Revenue generation from the Burroughs customer base, meanwhile, continued to slip. Bull HN held its own ground in the North American market; that in itself is surprising. Control Data was flat, with revenues at an estimated $0.5 billion, but is now offering booster processors made by Convex Computer Corp. to its installed base (1,800 units) of Cyber 900 customers. ▭

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PERIPHERALS

Everybody's Fighting For Your Business

Users are in the driver's seat. They can command greater features at lower prices for printers, terminals and storage as global competition heats up.

BY GREG BLATNICK, PHIL DEVIN AND JIM UPHAM

The biggest segment of the worldwide information technology industry is the least glamorous to most people. Peripherals manufacturers—companies that make the printers, terminals and storage devices used with computers—don't seem to generate the headlines that computer makers, networking companies or software suppliers do.

IBM's first run at laser printing.

Not that peripherals makers didn't try to attract attention in 1989. The printer industry saw unprecedented battles in price and performance. The terminals industry lost some of its luster in the United States. And the storage industry consolidated faster than anyone predicted.

Desktop Printer War

In 1989, war broke out in the electronic printer industry as suppliers of different types of desktop printing machines brandished features and prices in an all-out fight for customer orders.

But, as the year began, the desktop printing field was peaceful. Constituents knew their places and rarely crossed boundaries. Dot matrix printers allowed users to output spreadsheet calculations and other documents meant for internal use. Ink-jet printers, somewhat a novelty, gained acceptance because of their quiet, letter quality performance. Laser-based page printers served users whose needs for high-quality output justified the higher cost of the machines and the networks usually running them.

But the right choice for a printing solution became less than obvious as the year progressed. The makers of 9-pin dot matrix printers, thought to be dying with the competition from the 24-pin models, fought back with machines at lower prices (albeit with fewer features) to keep market share. Suppliers of 24-pin models, hemmed in at the low end, also had to fend off ink-jet printer rivals. They reacted in two ways. One, they offered feature-rich products at bargain prices—witness the Panasonic and Epson wide-carriage printer models priced below $700. Two, they bundled into their printers software that supports a greater number of type fonts.

Laser-based page printers for desktop use changed in price and functionality during 1989. Until last year, most models produced 8 pages per minute (ppm) and sold above $2,500. But the number of under-10ppm models almost doubled in 1989 to greater than a hundred—including 6ppm models for under $2,000 and 4ppm models for under $1,000. IBM entered the lineup with a new 10ppm model that rivaled market leader Hewlett-Packard Co.'s LaserJet series of printers.

The Big Events in Printers in 1989

IBM and HP square off; and Europe gets printer plants.

- Laser printer revenues surpass sales of impact dot matrix printers for the first time.
- HP's peripherals division surpasses $3 billion in revenue, driven by the explosive growth of its LaserJet family and DeskJet family of nonimpact printers.
- Apple sells its stake in Adobe Systems.
- IBM ups its investments in desktop laser printers. The 4019 LaserPrinter introduced in late 1989 is the first in a family of products that will result in a significant profit stream for the company during the next several years.
- The European Economic Commission's tariffs on Japanese serial, impact and dot matrix printers result in a massive shift in printer production to Europe.

Source: Dataquest Inc.

U.S. Terminal Slump

Although demand for display terminals by customers in Europe and the Pacific Rim was more than enough to offset slumping sales of such peripherals in the United States, the forces pulling down the U.S. terminal market wreaked havoc.

The slowdown in U.S. sales of midrange systems had much to do with the 3% decline in U.S. terminal shipments, which numbered 2.8 million units in 1989. Midrange suppliers—which sell tens, hundreds, even thousands of terminals in some cases, as part of sales of large systems—faced heightened competition from producers of local area networks and powerful desktop systems in 1989. Consequently, their sales of host-based systems—and the terminals attached to them—slumped.

Recovery isn't out of the question for midrange suppliers, if they move toward standardized distributed-computing architectures. They also must provide innovative and attractively priced windowing terminals to take advantage of these systems and their applications.

Independent terminal suppliers, usually able to maneuver through a market slowdown, were severely affected financially by the downturn in the U.S. market. As profitability remained elusive, industry veterans Ampex Corp. and C. Itoh & Co. Ltd. withdrew from the market. Even market leader Wyse Technology, crippled by its ailing personal computer business, found it necessary in 1990 to be acquired by Taiwan-based investment group Channel International to avert a financially bleak future. Other terminal makers such as Esprit Systems Inc. and TeleVideo

The Big Events in Terminals in 1989

A maturing market shows signs of consolidation.

- Midrange systems suppliers get terminal illness.
- Lower terminal prices don't expand demand.
- Channel International (Taiwan) offers to buy Wyse Technology.
- Ampex discontinues its terminal business.
- X-terminals emerge as an important technology.

Source: Dataquest Inc., DATAMATION

X-terminals: new star of stage and screen?

The Top 10 in Peripherals

Laser printers boosted peripheral sales at HP, Canon, Apple and NEC.

	DTM 100 RANK	COMPANY	PERIPHERALS REVENUES 1989 ($MIL.)	PERIPHERALS REVENUES 1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	10,049.0	11,214.0	-10.4%	18.0%
2	2	Digital	3,200.0	3,166.2	1.1%	5.7%
3	6	Hitachi	2,536.7	2,825.1	-10.2%	4.5%
4	7	HP	2,275.0	1,800.0	26.4%	4.1%
5	4	Fujitsu	2,174.3	2,728.5	-20.3%	3.9%
6	12	NCR	1,989.6	1,872.0	6.3%	3.6%
7	14	Canon	1,956.9	1,772.3	10.4%	3.5%
8	34	Seagate	1,797.0	1,351.0	33.0%	3.2%
9	11	Apple	1,635.6	1,350.0	21.2%	2.9%
10	3	NEC	1,630.7	1,599.7	1.9%	2.9%

* Percentage share of DTM 100 revenues

Systems Inc. continued to bathe in red ink, with no rescuer on the horizon.

Industry giant IBM was not immune to the market slowdown; it also suffered a drop in its terminal shipments in 1989, despite setting substantially lower prices for many of its models.

The Big Events in Storage in 1989

Investment bankers and lawyers mark a busy year.

- Seagate buys Control Data's disk drive subsidiary, Imprimis, giving the company a 41% share of the market for 3½- and 5.¼-inch disk drives.
- Writeable CD-ROM drives are shipped.
- IBM announces a magnetic recording density of 1 gigabit per square inch on a 5¼-inch disk drive.
- Domain Technology and Priam file for protection from creditors under Chapter 11 of the U.S. Bankruptcy Act. (MiniScribe follows on January 1, 1990.)
- Archive offers to buy Cipher Data, which would make Archive the largest tape vendor in the world.

Source: Dataquest Inc.

The market has changed. The display terminal market has matured, and growth can be achieved only by focusing on markets tightly defined by either geography, application or both.

For terminal companies to be successful in the 1990s, they must embark on regionalized manufacturing and marketing strategies. Moreover, they must address the display and communications requirements of distributed computing. The winning display terminal products of the '90s will be X-Window terminals—networked, local-processing displays—and alphanumeric terminals with superior ergonomic and user friendly features.

A Storage Revolution?

The worldwide storage industry last year grew less than it had in the previous year, with shipments of disk drives and other storage products expanding less than 30% in most market segments. But the business of making devices that store data was more profitable in 1989 than it was in 1988 for most suppliers.

Higher profitability is good news for users because it means storage suppliers have greater resources to spend on developing products that will be needed in the future.

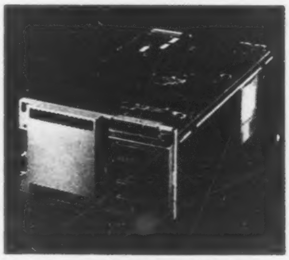
Users may, in fact, be about to witness a revolution in storage technology whereby the recording heads of disk drives actually ride on the surface of (rather than above or alongside) disk platters. Such a breakthrough will ultimately offer disk drives at 20 cents per megabyte from the factory, compared with factory prices of around $2 per megabyte today.

Virtually every major segment of the storage industry is enjoying growth. The worldwide market for rigid disk drives, popular storage devices for personal computers and workstations, expanded 26% to $35 billion in 1989. The global optical disk industry is still in its infancy at $1.1 billion but growing fast. Tape storage products, a $4.8 billion industry, have found a broader range of buyers and some newfound interest by major computer companies.

The 5¼-inch hard disk market began its decline as the 3½-inch drives gained in popularity. First production shipments of new 2½-inch diameter hard drives for notebook computers began in 1989. PrairieTek Corp., Conner Peripherals Inc., JVC Corp. and start-up Areal Technology Inc. are making them. Demand for these tiny drives may expand to more than a million units in 1992. IBM even has shown pictures of a laboratory-produced disk drive that is only 1.8 inches in diameter with 300MB of storage capacity.

Juke boxes are the new rage in optical disc technology. Despite the fact that they don't look anything like the old Wurlitzer in the malt shop of your youth, these mechanical mazes offer many gigabytes of on-line capacity as file servers or archival libraries. Juke boxes are available for write-once magneto-optical, and compact disc read only memory (CD-ROM) optical discs.

Helical scan tape-recording technology, once confined to use in home videocassette recorders, has ventured into the information systems world. Several U.S. and European suppliers are incorporating Japanese-made mechanical-recording decks into their data storage subsystems. Both the 4 millimeter digital audiotape decks and the 8mm Sony video decks are now being used to store computer data on low-cost, pocket-sized cassettes.



Seagate takes the disk drive market by storm.

Such innovation will continue to make storage one of the most interesting segments of the electronics industry. But expect further consolidation among suppliers as the industry continues to mature. Industry giants like IBM and Seagate Technology will be joined by new storage conglomerates. Archive Corp., Conner Peripherals, Hewlett-Packard, Memorex Telex NV and Quantum Corp. are suppliers that might reach the top of the storage elite by the end of the decade. ▭

Greg Blatnick is director of the display terminal industry service for Dataquest Inc. in San Jose; Phil Devin is associate director of Dataquest's computer storage service; and Jim Upham is director of Dataquest's printer service.

Networking Suppliers Feel the Pressure

Intensified customer demands for cost-effective connectivity in 1989 led to competitive bulk procurements, renewed interest in outsourcing and the rise of integrated networks.

BY DAVID M. RAPPAPORT

As Ralph Waldo Emerson is given credit for saying, "If you build a better mousetrap, the world will beat a path to your door." While the networking business in 1989 saw vendors trying to live up to their promises and start delivering those better mousetraps, few have had customers beating down their doors.

Vendors in the United States spent 1989 struggling through slack demand and stiff price competition. Internationally, the situation was only slightly better, although the forecast for worldwide communications industry growth is strong, with the European market in particular expected to explode as commercial and political barriers fall. Projections for a nearly doubling of communications equipment sales in Europe by 1993 even become conservative if the Eastern European countries obtain the foreign aid and financing they seek.

Developments in 1989 reflected a continued maturing of both vendors and customers and signaled a new era in customer-vendor relations. Customers faced with tighter budgets and massive investments in existing technology looked for ways to contain costs while meeting the networking demands dictated by increased global competition. All too often, this search was conducted in a poorly defined market crowded with computer manufacturers seeing networking as the panacea for slowing growth and telephone companies jockeying for market share or seeking ways to capitalize on a core business that was rapidly becoming a commodity.

In frustration, customers have started to question whether they are getting the most for their networking dollar. This new, no-nonsense approach has led organizations to reject those vendors that cannot deliver promised products or services that offer cost-effective connectivity while protecting the customer's installed base of equipment. Thus, 1989 ushered in competitive bulk procurements, commonly referred to as Tariff 12s, renewed interest in outsourcing and the acceptance of integrated networks.

Responding to AT&T's cries that MCI Communications Corp. and US Sprint Communications Co. had an unfair advantage because they were not constrained in pricing their services, the Federal Communications Commission authorized a custom network tariff to allow AT&T to be more responsive in competitive situations. The birth of "Tariff 12" triggered fierce price competition among the three major carriers. It also created significant savings opportunities for user organizations willing to put their voice and data networks up for bid. Dozens of companies took advantage of this. Competitive bids will continue through 1990 and for as long as the carriers believe they can use them to secure market share.

1989 caught AT&T in heavy traffic.

The increasingly critical role networking plays in most companies' competitive strategy often strains these firms' ability to effectively implement and operate the resulting environment. In the hope of improving the service while containing costs, several organizations investigated the possibility of outsourcing some portion of their networks' operations and maintenance. This evaluation led Eastman Kodak Co. to issue contracts to IBM, Digital Equipment Corp. and Businessland Inc. IBM has been hired to run Kodak's data centers and System Network Architecture (SNA) networks. Digital will manage the film maker's other voice and data wide area networks. And Businessland will handle its personal computers and local area networks.

Critical Networks

Merrill Lynch & Co. considered turning over the operation of part of its voice and data networking to a team from IBM and MCI, but concluded that the network was too mission critical to allow someone else to operate. Avon Products Inc. also considered outsourcing and, while deciding not to, found the evaluation process to be useful for appraising the effectiveness of its own operation. Responding to this new market opportunity among the vendors were not only Digital, IBM and MCI, but such varied companies as AT&T, the Bell operating companies, Electronic Data Systems Corp. Hewlett-Packard Co. and Westinghouse Electric Corp.

Integrated backbone networks carrying voice and data became the standard at many

Telecom Vendors Reach Out

Price competitive services and the rise of high-speed integrated communications characterize the year.

- The birth of "Tariff 12" triggers fierce price competition among the three major carriers.
- Several organizations investigate, and some initiate, outsourcing of some portion of the operations and maintenance of their corporate networks.
- Reductions in the cost of 1.44Mbps T1 circuits, the greater availability of 2.04Mbps E-1 lines in Europe and the introduction of fractional T1 service make integrated networking more affordable.
- StrataCom introduces the industry's first frame relay interface, which provides sophisticated routing capabilities and lays the groundwork for such emerging packet services as IEEE 802.6 Metropolitan Area Networks.
- High-speed corporate networks and the overall lowering of bandwidth costs promote the resurgence of videoconferencing.
- The LAN market as a whole shows signs of moderating, save for an explosion in the market for 10Mbps Ethernet over unshielded twisted pair wiring.
- All of the value-added network providers announce X.400-based e-mail services and the intention of supporting EDIFACT, the international standard for exchanging EDI messages.

Source: The DMW Group

The Top 10 in Communications

Even though it sold off ROLM, IBM is still the leader in datacom.

	DTM 100 RANK	COMPANY	DATACOM REVENUES 1989 ($MIL.)	DATACOM REVENUES 1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	3,000.0	3,307.0	-9.3%	15.7%
2	17	AT&T	1,445.0	1,250.0	15.6%	7.6%
3	24	NTT	1,355.3	1,018.3	33.1%	7.1%
4	9	Siemens	1,345.7	1,338.3	0.6%	7.0%
5	14	Canon	1,304.6	1,132.3	15.2%	6.8%
6	47	Northern Tel.	1,150.0	900.0	27.8%	6.0%
7	15	Matsushita	906.0	929.1	-2.5%	4.7%
8	33	Ricoh	801.1	850.3	-5.8%	4.2%
9	4	Fujitsu	797.3	816.7	-2.4%	4.2%
10	32	Alcatel	756.4	721.9	4.8%	4.0%

* Percentage share of DTM 100 revenues

corporations by 1989. The biggest reason, of course, was reductions in the cost of 1.44 megabit per second T1 circuits, the greater availability of 2.04Mbps E-1 lines in Europe and the introduction of fractional T1 service, which made such networks affordable for more organizations.

Network Equipment Technologies Inc. continued its dramatic sales growth and remained dominant in the large-backbone switch market while expanding into smaller, entry-level switches and X.25 concentrators.

Sophisticated Routing

StrataCom Inc. introduced the industry's first frame relay interface, which provides sophisticated routing capabilities and lays the groundwork for such emerging packet services as the IEEE 802.6 Metropolitan Area Networks (MANs).

AT&T, with the delivery of AccuMaster Integrator, and IBM, with extensions to NetView, positioned themselves as vendors with the tools required to manage integrated networks. And, as IBM was forming alliances to expand its network management capabilities to encompass LANs and private branch exchanges (PBXs), it concluded the sale of Rolm to Siemens AG. Under the terms of the sale, IBM is continuing to sell Rolm PBXs, but Siemens is controlling development.

Swift Backbones

High-speed corporate networks and the overall lowering of bandwidth costs also promoted the resurgence of videoconferencing. Compression Labs Inc. and PictureTel Corp. together control more than 90% of the U.S. videoconferencing equipment market for sales of systems under $50,000. As corporate networks evolve and the bandwidth of their T1-based facilities are consumed by voice, videoconferencing and LAN connectivity, users' need for even higher speed backbones is evident. Network Equipment Technologies and Infotron brought 45Mbps T3 multiplexers to market in response to these growing requirements. The trend also prompted both AT&T and Northern Telecom Ltd. to announce support for the SONET multiplexing standard in their central office switching equipment. Their move encouraged others to support the scheme, which is based on fiber optic transmission operating at speeds in multiples of 30Mbps up to 1 gigabit in both long-haul and campus networking.

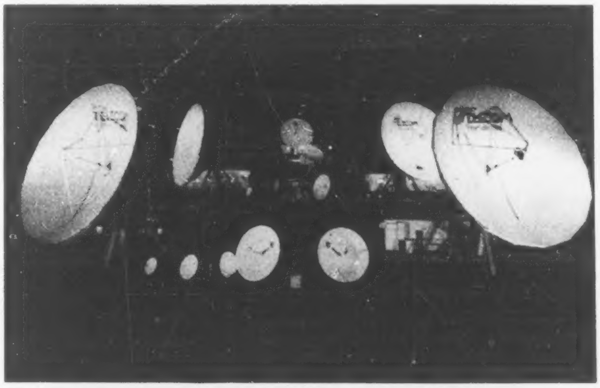
The LAN market as a whole showed signs of moderating in 1989. Despite continued growth in the sales of LAN operating systems and adapter boards, both leading independent LAN companies, Novell Inc. and 3Com Corp., had lower than anticipated sales. Although Novell's sales increased by more than 20%, many analysts expected its growth in 1989 to be higher. Synoptics Communications Inc. was able to take advantage of an explosion in the market for 10Mbps Ethernet over unshielded twisted pair wiring by capturing about 70% of sales and forcing others, like 3Com, to respond quickly.

What's Hot

The hottest sellers were LAN/WAN bridges, routers and gateways, as organizations struggled to connect their islands of technology. Despite most vendors' concerns over diverting resources from their longer term development efforts in connection with the Open Systems Interconnection protocol, acceptance continued of the Transmission Control Protocol/Internet Protocol (TCP/IP) standard as the multivendor connectivity protocol set. Among those enhancing their TCP/IP support was IBM with software for its OS/2 PC operating system, thereby offering a TCP/IP implementation for each of its major operating systems.

Significant activity also occurred among the value-added network providers during 1989. British Telecommunications PLC purchased McDonnell Douglas Corp.'s Network System Group, including Tymnet, and announced plans to merge Tymnet and Dialcom services. AT&T moved into the value-added market in the United Kingdom by acquiring Istel, a networking spinoff of the Rover Group. MCI strengthened its position both internationally and in data communications by acquiring Computer Sciences Corp.'s remaining 25% holding in Infonet, the other equity partners in Infonet being the Post, Telephone and Telegraph services (PTTs) from Europe and Asia. All of the value-added network providers announced X.400-based electronic mail services and the intention of supporting EDIFACT, the international standard for exchanging EDI messages.

David M. Rappaport is with The DMW Group, an international network integration consulting firm in Ann Arbor, Mich.



British Telecom searched the globe for acquisitions.

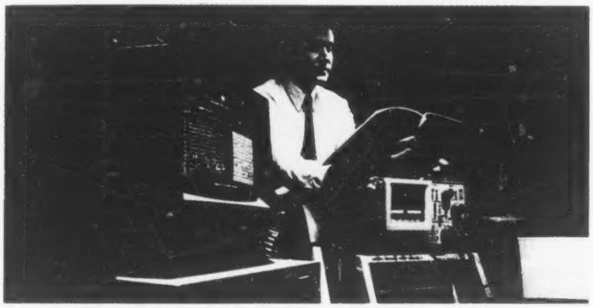
SOFTWARE

Software Stays at The Cutting Edge

Software vendors eagerly embraced vanguard technologies in 1989, delving aggressively into UNIX, cooperative processing and object-oriented programming.

BY HARVEY L. POPPEL

Last year was another year of change and consolidation for the software industry. Feeling its age and the heat from less than robust hardware sales, the industry grew only 15%, failing for the first time in several years to achieve the 20% growth rates more characteristic of immature markets.



France's Cap Gemini brings savoir faire to the desktop.

The consolidation caravan, however, continued to pick up speed. Topping the list of most significant takeovers in 1989 were Cullinet Software Inc., which was captured by Computer Associates International Inc., and Management Science America Inc., which was bought out by Dun & Bradstreet Corp.

Major developments in the areas of UNIX, networking, object-oriented programming, computer-aided software engineering (CASE) and microsystems utilities helped shape the software market in 1989.

In contrast to the more reluctant hardware vendors, most software suppliers have been eager to embrace UNIX. Last year that eagerness turned to optimism as suppliers' hopes for a single UNIX standard hit an all-time high. But that optimism was dampened when a true standard was not put forth by either the Open Software Foundation or UNIX International Inc.

Despite that disappointment, the heightened visibility of UNIX among software developers resulted in a plethora of new products, some in such nontraditional areas as securities-trading systems and computer-integrated manufacturing (CIM). More powerful networking software can now link UNIX workstations that had formerly operated in the stand-alone mode.

The networking software that made its way onto the market last year falls into two groups: cooperative processing (or client/server computing) and enterprisewide network management. Recently introduced applications such as OfficeVision from IBM, All-in-1 Phase II from Digital Equipment Corp. and Object Office from Data General Corp. are first steps in the evolution of cooperative processing. In addition, Ashton-Tate Corp., IBM, Ingres Corp., Novell Inc. and Oracle Corp. are among the companies working on Structured Query Language (SQL)-type database products upon which applications will be developed.

Vital Tools

The need to run increasingly complex and intertwined networks has fueled demand for enterprisewide network management tools. Those tools are vitally needed because users can no longer cope with the islands of automation that require them to separately monitor isolated network management packages for such elements as mainframes, local area networks (LANs), multiplexers, T1 switches and private branch exchanges (PBXs).

Throughout last year, the likes of AT&T, Digital, Hewlett-Packard Co. and IBM continued to aggressively market their network management products, jockeying for the coveted position of "manager of managers." Nevertheless, by year's end, all of the sundry network management products—from IBM's Systems Network Architecture (SNA) offering, NetView, to products based on the Open Systems Interconnection (OSI) standard—fell far short of the goal of providing complete centralized monitoring and control capabilities. So, until the mid-1990s, most users will probably have to resort to their own staff or third-party systems integrators to tailor vendor products to satisfy their network management requirements.

Lotus 1-2-3, take 3.

An Object Orientation

A slew of new product announcements in 1989 set the stage for object-oriented programming (OOP) to evolve during the '90s into the preferred programming environment for commercial applications. Although the OOP concept has been around since the 1970s, actual products have been scarce and limited to complex scientific and engineering applications.

Today, cooperative processing and multimedia systems have introduced another form of complexity into the computing equation. That complexity, which is not adequately addressed by current development environments and database systems, can be well served by object-oriented programming, which can meet both user and vendor needs for software that is easy to use, modular, extendable, portable and reusable.

Indeed, the benefits of OOP are compelling. The programming style shortens de-

The Software Scoop

1989 featured software companies eagerly embracing new technologies.

- Vendors introduce a plethora of UNIX products, some in nontraditional areas like securities trading and CIM.
- First steps are taken toward the development of cooperative-processing software with IBM's OfficeVision, Digital's All-in-1 Phase II and DG's Object Office.
- A slew of new product announcements sets the stage for object-oriented programming to evolve into the preferred programming environment for commercial applications.
- IBM introduces its AD/Cycle applications development environment, thus confirming de facto standards in the fragmented CASE market.
- New e-mail, file transfer, menu systems and shells add sparkle to the microsystem utilities market.

Source: Broadview Associates

Top 10 in Software

	DTM 100 RANK	COMPANY	SOFTWARE REVENUES 1989 ($MIL.)	1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	8,424.0	7,927.0	6.3%	34.3%
2	4	Fujitsu	1,449.5	1,456.4	-0.5%	5.9%
3	44	CA	1,290.2	705.4	82.9%	5.2%
4	3	NEC	1,065.4	1,085.5	-1.8%	4.3%
5	5	Unisys	875.0	875.0	0.0%	3.6%
6	2	Digital	825.0	794.6	3.8%	3.4%
7	50	Microsoft	820.8	610.8	34.4%	3.3%
8	6	Hitachi	724.8	680.1	6.6%	2.9%
9	9	Siemens	638.3	626.4	1.9%	2.6%
10	7	HP	600.0	500.0	20.0%	2.4%

* Percentage share of DTM 100 revenues

velopment cycles and improves software maintenance. It also helps provide users with access to data that are carried on increasingly distributed multiplatform networks.

OOP products fall into four basic categories: operating systems, programming languages, user interfaces and databases. This breakdown is reflected in the products that were introduced last year, suggesting that the major software vendors are going after the OOP market on all four fronts. The most hotly contested battles, however, will be fought on the database management system (DBMS) arena.

Relational DBMS (RDBMS) suppliers will undoubtedly adopt the object-oriented database approach over the next few years. This will be good news for users, since object-oriented DBMSs will allow them to integrate a variety of data types—everything from procedures to images and voice. This capability makes OOP an ideal choice for the multimedia systems era of the '90s.

During 1988 and 1989, the established DBMS vendors, led by California vendors Sybase Inc. of Berkeley and Informix Software Inc. of Menlo Park, began adding object-oriented features to their RDBMSs. Others, like Oracle, are attempting to incorporate these features into their offerings by enhancing their data manipulation languages.

Another technology destined to help the software development process is CASE. Last September, IBM set the stage for the further evolution of this technology when it unveiled its AD/Cycle. With the announcement, IBM signalled its willingness to stand behind AD/Cycle as the de facto applications development standard in the fragmented CASE market.

IBM's investments in CASE companies Bachman Information Systems Inc., Index Technology Corp. and KnowledgeWare Inc. attest to just how costly and complex the technology can be to develop. These equity stakes also indicate Big Blue's fear of gambling on a solo effort to develop a full suite of life cycle products.

Pioneers in PC Utilities

Firms such as Fifth Generation Systems Inc. and Peter Norton Computing Inc. probably knew that they weren't taking much of a gamble when they set out several years ago to pioneer the microsystems utility segment of the software market. That segment was given legitimacy when Ashton-Tate and Lotus Development Corp. rolled out their utility wares.

Utilities either facilitate the use or enhance the performance of hardware, software or peripherals. At the PC level, there are programs for file managers, communications, and program restoration and backup. New products and whole new product categories began to surface last year to satisfy the needs of the microcomputer environment.

CA's Wang to cultivate Cullinet.

There were electronic mail programs such as cc: Mail from cc:Mail Inc., file transfer software such as Laplink from Traveling Software Inc. and menu systems typified by Direct Access from Delta Technology International Inc. Network diagnostic and DOS shell products were also popular, as was antivirus detection and repair software. ▭

Microsoft's headquarters is the center of the desktop software universe.

Harvey L. Poppel is a partner at Broadview Associates, a leading IT merger and acquisitions firm in Fort Lee, N.J. He was assisted with the article by the firm's associates.

SERVICES/MAINTENANCE

Service Providers Expand Their Horizons

Service and maintenance providers are beefing up their offerings in response to changing IS appetites.

NORMAN G. LITELL AND RICHARD MUNN

The world of information services no longer revolves around small, niche players. Instead, the sun is shining on a new world populated by providers offering a much broader range of services aimed at meeting more diverse and complex customer needs.

Maintaining Customers in 1989

The customer is king to maintenance vendors.

- Hardware maintenance still accounts for 75% of the business.
- As hardware becomes more reliable, vendors expand into other areas, such as site preparation and construction, systems integration, service coordination and network management.
- Software support is seen as a key area of expansion by maintenance firms.
- Maintenance companies begin to design custom service strategies account by account.
- As maintenance companies become more customer oriented, prices come down.

Source: The Ledgeway Group

Those needs are a reflection of the key issues and trends that promise to influence the services market for the next several years. Strides in certain technologies are changing the way data ownership and processing capacity are distributed, both physically and organizationally. Some of those major advances are coming in the areas of voice/data networking, distributed and relational database management systems, workstations and imaging.

To integrate these evolving technologies into existing systems requires hardware and software standards. Today, one of the main value-added features that a systems integrator provides is the ability to develop a solution connecting multiple technologies, applications and data structures. Such system complexity is causing service vendors to broaden their range and expertise.

Some vendors are also broadening the actual scope of their business through mergers and acquisitions, moves that are consolidating the services industry. The Big Eight accounting firms have been compressed into the Big Six, and many smaller, specialty firms have been melded into larger companies looking to expand their functional and vertical-industry muscle. IBM has also been spreading its wings, going after minority stakes in software and systems integration companies.

All in all, there has been a blurring of the distinctions between traditional product and services markets. Some vendors focus on specific industries, some base their offerings on certain technologies, while others serve only select hardware platforms. These specializations are expected to continue in the years ahead.

ADP helps integrate personnel and payroll.

How's Everybody Doing?

Also expected to continue in the services market over the next five years is an overall compound annual growth rate of 16%, according to the Mountain View, Calif.-based market research firm Input Inc. Contributing to that healthy growth will be the five segments of the services market—processing services, systems operations, network services, systems integration and professional services—which together pulled in $51 billion in 1989.

The $16 billion processing services segment is the slowest growing area of the market. To boost their business, the larger and more sophisticated vendors are branching out into software, systems integration and turnkey systems.

Computer Sciences Corp.

Also at $16 billion, the professional services sector is fast becoming a two-tiered market. Large-scale integrated firms are evolving to tackle customized applications for large clients and projects. And small firms that support small clients with standardized applications are springing up, thanks to the increased availability of workstations, local area networks and applications packages.

The older and larger processing and professional sides of the business are expanding at a much more sluggish clip than the newer and smaller systems integration and network services markets. The fastest growing segment, systems integration, which accounted for $6 billion in revenues last year, is predicted to pull in $17 billion by 1994.

Network services is the second fastest growing segment. The increased availability and connectivity of networks has helped vendors ease into this service arena. They are providing a wider and more flexible range of services that leverage their network capabilities and databases. Today, the majority of this market is accounted for by on-line information services.

Increasingly, both systems integration and systems operations are being handled by the same vendor. That's because contracts for systems integration work often lead to long-term pacts for systems operations. The hottest topic in today's $6 billion systems operations realm is outsourcing. The outsourcing deal be-

Photograph by Camille Vickers

meets customers needs.

tween IBM and Eastman Kodak Co. announced late last year brought a new sense of legitimacy to an old and sleepy business.

Beefed-up Services

Like their counterparts in IS services shops, companies engaged in customer service—those that have earned their bread and butter by catering primarily to maintenance needs—are also beefing up their menu of à la carte offerings. In addition to maintenance, the firms in this fast-changing field are being forced to provide a fuller and more eclectic menu because the pickings are steadily getting slimmer on the more traditional maintenance side of the business.

The one staple that has carried these vendors the furthest the longest, though, is hardware maintenance. In 1989, hardware maintenance accounted for 75% of the $55.2 billion in revenues which were gobbled up by hungry customer service vendors, according to The Ledgeway Group of Lexington, Mass. By 1994, that percentage is expected to shrivel like a piece of bacon on a hot frying pan to 61%. Much of that shriveling is due to the simple fact that hardware is becoming more reliable. In fact, major hardware makers will soon be promising mean time between failure rates of 15 years on their products.

Bringing Home the Bacon

Destined to bring home more of the bacon in this market, therefore, will be a mixture of services in new spheres such as site preparation and construction, systems integration, service coordination and network management. Customer service providers continued to move further into these spheres, at the same time edging into the same areas that the IS services vendors were exploring last year, in an attempt to respond to customers' appetites for a more varied diet of IS support.

Some of that support came in the area of software. Under that software support umbrella, service firms helped clients set up user help desks and run data centers, networks and even mailrooms on a contract basis.

User demand is fueling this diversification into new professional services, which are predicted to generate $7.2 billion by 1994. There's already evidence that firms in the field are tailoring their offerings to the newfound needs of their customers. They're designing custom service strategies, account by account. They're establishing partnerships with other service shops to provide more complete services for clients. And they're meeting and managing customer expectations with regard to systems availability. Gone are the days when customers were nailed with annual service contracts that amounted to 12% of the list price of their equipment. Finally, the customer services pendulum has swung toward the customer. ▭

Norman G. Litell is director of the market analysis program at Input Inc. of Mountain View, Calif. Richard Munn is president of The Ledgeway Group, a division of San Jose-based Dataquest Inc.

In Service in 1989

The players come out of their niches.

- Technologies are changing the way data ownership and processing capacity are distributed.
- Hardware/software standards increase in importance.
- Vendors broaden their businesses through mergers and acquisitions, which causes a consolidation in the number of vendors in the market.
- The line between the product and service markets becomes blurred.
- The increasing complexity of systems causes service vendors to broaden their range and expertise.

Source: Input Inc.

The Top 10 in Maintenance

Price cutting and competition in maintenance are putting a lid on growth.

	DTM 100 RANK	COMPANY	MAINTENANCE REVENUES 1989 ($MIL.)	1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	1	IBM	7,036.0	7,347.0	-4.2%	24.0%
2	2	Digital	3,300.0	3,212.0	2.7%	11.3%
3	7	HP	2,000.0	1,742.0	14.8%	6.8%
4	5	Unisys	1,947.0	1,971.0	-1.2%	6.6%
5	12	NCR	1,647.0	1,678.6	-1.9%	5.6%
6	8	Groupe Bull	1,228.4	1,374.7	-10.6%	4.2%
7	21	Wang	994.0	829.4	19.8%	3.4%
8	9	Siemens	957.4	968.1	-1.1%	3.3%
9	10	Olivetti	902.6	929.6	-2.9%	3.1%
10	20	Xerox	850.0	800.0	6.3%	2.9%

* Percentage share of DTM 100 revenues

The Top 10 in Services

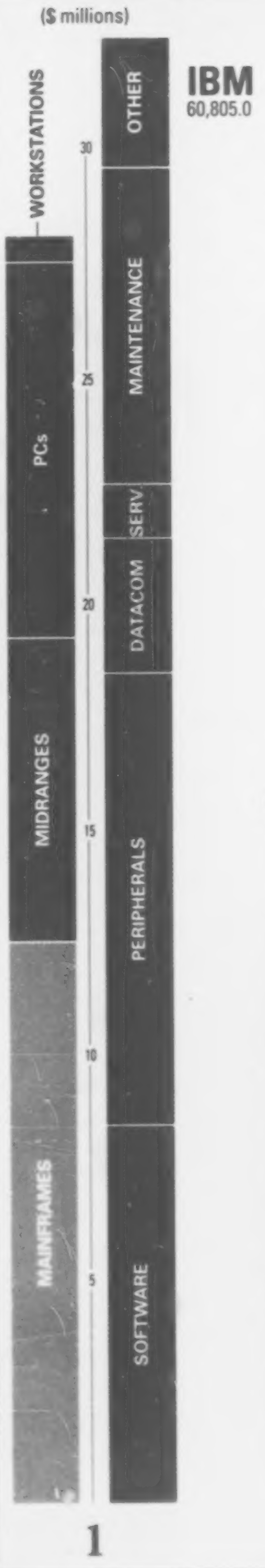
EDS, Andersen Consulting and IBM post strong growth in revenues.

	DTM 100 RANK	COMPANY	SERVICES REVENUES 1989 ($MIL.)	1988 ($MIL.)	% CHANGE	MARKET SHARE*
1	23	EDS	2,477.9	1,907.6	29.9%	11.0%
2	36	ADP	1,689.5	1,617.0	4.5%	7.5%
3	38	TRW	1,565.0	1,533.0	2.1%	7.0%
4	41	CSC	1,442.8	1,253.4	15.1%	6.4%
5	2	Digital	1,386.7	1,100.0	26.1%	6.2%
6	45	Andersen	1,225.7	945.7	29.6%	5.5%
7	1	IBM	1,200.0	935.0	28.3%	5.3%
8	48	Cap Gemini	1,103.4	976.5	13.0%	4.9%
9	24	NTT	898.7	675.6	33.0%	4.0%
10	5	Unisys	825.0	825.0	0.0%	3.7%

* Percentage share of DTM 100 revenues

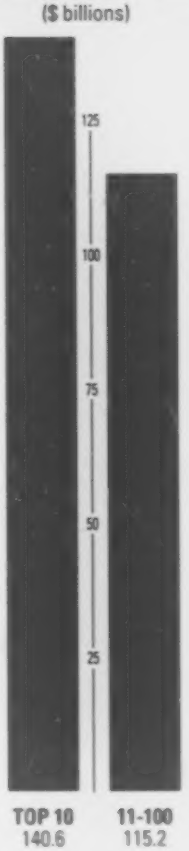
MARKET BREAKDOWN

THE DATAMATION 100

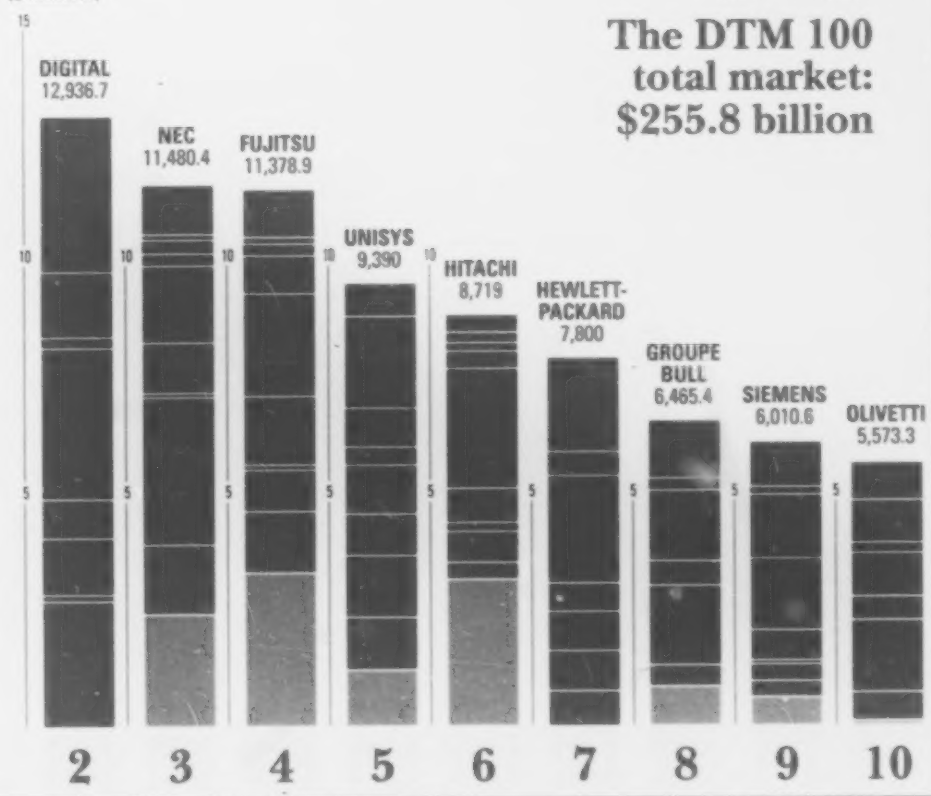


IBM accounts for almost 25% of the DTM 100 market. As a group, the top 10 make up 55%, with four from North America, three from Europe and three from Asia.

TOP 10 COMPANIES



The DTM 100 total market: $255.8 billion



THE DATAMATION 100

RANK	COMPANY	1989 TOTAL IS REVENUE	MAIN-FRAMES	MID-RANGES	PCs	WORK-STATIONS	SOFT-WARE	PERI-PHERALS	DATA-COM	SERVICES	MAINTE-NANCE	OTHER
1	IBM	60,805.0	12,509.0	6,753.0	8,343.0	591.0	8,424.0	10,049.0	3,000.0	1,200.0	7,036.0	2,900.0
2	Digital	12,936.7		2,670.0	135.0	1,195.0	825.0	3,200.0	225.0	1,386.7	3,300.0	
3	NEC	11,480.4	2,391.8	1,471.3	3,116.5	87.0	1,065.4	1,630.7	253.7	289.9	434.9	739.3
4	Fujitsu	11,378.9	3,261.5	1,304.6	869.7	108.7	1,449.5	2,174.3	797.3	253.7	326.1	833.5
5	Unisys	9,390.0	1,200.0	1,122.0	1,300.0		875.0	1,039.0	375.0	825.0	1,947.0	707.0
6	Hitachi	8,719.0	3,116.5	362.4	652.3	181.2	724.8	2,536.7	362.4	181.2	434.9	166.7
7	Hewlett-Packard	7,800.0		750.0	850.0	825.0	600.0	2,275.0	500.0		2,000.0	
8	Groupe Bull	6,465.4	840.5	452.5	1,681.0		517.2	1,487.0		258.6	1,228.4	
9	Siemens	6,010.6	611.7	345.7	351.1	79.8	638.3	1,516.0	1,345.7	164.9	957.4	
10	Olivetti	5,573.3	105.6	607.0	1,523.4		497.7	917.0	216.7	0.0	902.6	803.3
11	Apple	5,372.3			3,574.2		162.5	1,635.6				
12	NCR	5,319.0	183.4	475.0	333.0		125.0	1,989.6	141.0	425.0	1,647.0	
13	Toshiba	4,595.1		978.4	1,340.8	116.0		942.2	746.5	0.0		471.1
14	Canon	3,783.3		14.5	145.0			1,956.9	1,304.6		362.4	
15	Matsushita	3,663.7			145.0	800.9		1,594.5	906.0		217.4	
16	Compaq	2,876.1			2,876.1							
17	AT&T	2,865.0		150.0	700.0		75.0	150.0	1,445.0	145.0	200.0	
18	NV Philips	2,814.8		353.6	443.2		117.9	947.7	457.4		396.1	99.0
19	Nixdorf	2,792.6	117.0	425.5	191.5		372.3	1,196.8	159.6	31.9	297.9	
20	Xerox	2,790.0				325.0	90.0	1,025.0	400.0	100.0	850.0	
21	Wang	2,697.0		570.0	430.0		100.0	493.0	80.0	30.0	994.0	
22	STC	2,643.4	466.1	318.9	81.8	114.5	327.1	248.0	81.8	424.6	490.7	90.0
23	EDS	2,477.9								2,477.9		
24	NTT	2,254.0							1,355.3	898.7		
25	Nihon Unisys	2,112.7	422.5	260.9	218.7		587.3	475.4			147.9	
26	Amdahl	2,101.0	1,470.8				42.0	252.1	63.0		273.1	
27	Sun	2,062.5				1,443.8	103.0	309.4			206.3	
28	Memorex	2,056.6			196.2			1,177.1			401.4	281.8
29	Mitsubishi	2,025.7	166.7	456.6	217.4			670.4	514.6			
30	Oki	1,952.0		72.5	85.5		140.6	1,137.2	322.5		193.5	
31	Tandy	1,892.0			1,330.0		75.0	382.0			105.0	
32	Alcatel	1,800.3			124.4		87.0	744.3	756.4		88.1	
33	Ricoh	1,799.5			287.5		90.8	438.7	801.1		90.8	90.8
34	Seagate	1,797.0						1,797.0				
35	CDC	1,691.0	465.0				100.0	751.0		55.0	320.0	
36	ADP	1,689.5								1,689.5		
37	Tandem	1,676.8		709.6		50.0		460.0	150.0	25.0	282.2	
38	TRW	1,643.0								1,565.0	78.0	
39	Prime	1,520.0		525.8			90.0	300.0			604.2	
40	Seiko Epson	1,449.5			579.8			869.7				
41	CSC	1,442.8								1,442.8		
42	C. Itoh	1,345.9				471.1	94.2	621.1	50.7	108.7		
43	Data General	1,296.5		245.9		40.0	40.0	540.0			430.6	
44	CA	1,290.1					1,290.2	0.0				
45	Andersen	1,225.7								1,225.7		
46	Nokia	1,191.9		119.2	396.4	93.3	23.8	93.3	189.4	160.0	116.6	
47	Northern Telecom	1,150.0							1,150.0			
48	Cap Gemini	1,103.4								1,103.4		
49	Storagetek	982.5						710.5			272.0	
50	Microsoft	952.8					820.8	52.0				80.0

Revenue figures are in millions of dollars.

THE DATAMATION 100

RANK	COMPANY	1989 TOTAL IS REVENUES	MAIN-FRAMES	MID-RANGES	PCs	WORK-STATIONS	SOFT-WARE	PERI-PHERALS	DATA-COM	SERVICES	MAINTE-NANCE	OTHER
51	Commodore	866.5			866.5							
52	Intergraph	860.1		60.0		260.0	125.0	126.3			228.8	60.0
53	Motorola	860.0		160.0			25.0		500.0		175.0	
54	Mannesmann	819.1		286.7				409.6			122.9	
55	Intel	812.0			812.0							
56	Cray	784.7	633.6				12.9				138.0	
57	Oracle	769.3					554.3			215.0		
58	General Electric	740.0								550.0	190.0	
59	Amstrad	717.0			717.0							
60	Conner Peripherals	704.9						704.9				
61	3M	696.4						631.4		65.0		
62	British Telecom	692.5							332.4	360.2		
63	Black & Decker	687.6								687.6		
64	Finsiel	662.5					391.5			271.0		
65	American Express	660.0								660.0		
66	Lockheed	590.0					80.0	360.0		30.0	120.0	
67	Texas Instruments	585.0		125.0			55.0	265.0		20.0	120.0	
68	Racal	573.9							573.9			
69	Comparex	566.0	181.1					294.3			90.6	
70	Lotus	556.0					516.0			40.0		
71	SHL	539.8			287.2		33.8			201.9	16.9	
72	CSK	520.0	16.0	78.1			310.1	4.7		14.3		96.8
73	Martin Marietta	502.2								502.2		
74	NYNEX	495.0					178.0			317.0		
75	Acer	493.7			377.8			42.8	13.3			
76	AST Research	482.0			398.1				25.8			58.1
77	Science Applications	479.0					239.0			240.0		
78	Wyse	452.3			195.0			200.0				57.5
79	Dun & Bradstreet	450.0					450.0					
80	Ernst & Young	450.0								450.0		
81	Maxtor	447.2						447.2				
82	Kodak	445.0					35.0	270.0		10.0		130.0
83	SD-Scicon	431.5		50.2						381.3		31.9
84	Novell	429.9					287.6		98.6		43.0	
85	Mentor	426.4					333.9				92.5	
86	Alps	420.4						420.4				
87	3Com	413.9				107.5			82.7			223.6
88	Everex	402.0			227.8			174.2				
89	Sligos	400.7					8.9			385.5	6.3	
90	MAI Basic Four	397.0		119.0			55.0	63.0			142.0	18.0
91	Quantum	394.2						394.2				
92	Shared Medical	390.0		145.0						245.0		
93	Dell	388.6			307.0			81.6				
94	Mitac	380.0	5.7	28.5	178.6			133.0			38.0	
95	Sema Group	378.6					378.6					
96	Tandon	377.9			377.9							
97	Kyocera	366.4			145.0			145.0	72.5			
98	Boeing	359.2								359.2		
99	Norsk Data	358.1		198.0			29.1				131.0	
100	Concurrent	344.6		237.8							106.8	

THE DATAMATION 100

The suppliers in dominant positions are those that know how to apply information technology and deliver it via networks to users. Watch out for Sony and Sun, Cap Gemini and Intel.

An Age of Applications and Networks

If timing is, indeed, everything in life, DATAMATION's scheduling couldn't have been any better for an interview with Robert J. Conrads on what the 1990s hold in store for us. On the morning we sat down to interview Conrads, the mergers and acquisition chief for First Boston Corp. thought he had just completed the industry's first big deal of the new decade. (It unraveled weeks later.)

"Have you heard about the Lotus-Novell merger?" Conrads asked us shortly after we arrived at First Boston's Park Avenue headquarters in New York City. Thinking that the M&A chief wanted to start the interview off on the lighter side, we immediately asked him for the punch line. "It's no joke," he said of the proposed marriage between Lotus Development Corp. and Novell Inc. And he went on to elaborate about why such a union of financial equals makes sense. It was a serious start to a very serious conversation with Conrads about the future of the industry—a 90-minute dialogue, excerpts from which you see here.

Our conversation covered a range of companies, including U.S. suppliers AT&T, Compaq Computer Corp., Computer Associates International Inc., Cray Research Inc., Digital Equipment Corp., General Dynamics Corp., Hewlett-Packard Co., Intel Corp., Lotus, McDonnell Douglas Corp., Microsoft Corp., Motorola Inc., NCR Corp., Novell, Poqet Computer Corp. and Supertech; European suppliers Cap Gemini Sogeti, Groupe Bull, Hoskyns Group Ltd., Ing C. Olivetti & Co. SpA, NV Philips' GL, Sema Group, Siemens AG and Sligos; and Japanese suppliers Fujitsu Ltd., NEC Corp., Okigawa Electric and Sony Corp.

Conrads' vision of information technology is one shaped by

BY JOE KELLY AND TIM MEAD

knowledge and experience. He spent his undergraduate and early graduate years as a Yellow Jacket, earning bachelor's and master's degrees in atomic physics from the Georgia Institute of Technology. He picked up a master's degree in business administration at Harvard University before joining McKinsey & Co., a management consulting firm whose electronics practice he headed. From McKinsey, he joined Kidder, Peabody & Co. He then switched investment banks, choosing to ply his M&A trade at First Boston.

Q: The most frequently mentioned subject in the magazine's conversations with users and suppliers is talk of a major change under way in the information technology industry—away from computing on hosts toward doing so in a client/server environment. Do you see such a change? If so, what impact will it have on the world's top 100 suppliers?
A: What's going on is very similar to the change that we had when we went from mainframes to minicomputers. If you go back to the late 1960s, it was thought that the only real computing that could be done was at the mainframe level. Digital and some others destroyed that notion. As technology enabled more robust implementation of applications on smaller boxes, all of a sudden applications that no one had ever dreamed of were running on computers in the mid- to late-1970s.

The same thing is already happening in microcomputers. And it will continue to evolve to the point where a mainframe acts as a server, a traffic cop, a number cruncher. The real computing—particularly the application interface, which is becoming more complex—will occur at the local level.

The local environment is not just a microcomputer. It's a network where you can move a lot of intelligence [information] around at any given instant.

Q: The single biggest trend evident in this and previous years' DATAMATION 100 data is that demand for information technology (IT) is growing much more rapidly in Europe and the Pacific Rim than in the United States. What are your thoughts on the subject?
A: The base of information systems installed in the United States is a lot larger. When you look at absolute dollar increases in the amount users are spending on computers, the U.S. market is still quite substantial. Also, recognize that the United States is always three to five years ahead of Japan and Europe.

The real growth curve in computer spending that we saw in the United States in the early 1980s is just now hitting Europe and Japan. They're investing in technology that allows them to do a lot of things that they hadn't been able to do in the past.

Q: Do you expect that the indigenous suppliers in the Pacific Rim and Europe will capture most of the information technology growth in those regions, or do you see U.S. companies getting their fair share?
A: I think that U.S. suppliers are going to get their fair share. But in Japan, in particular, I think we're going to see local suppliers in partnership with U.S. companies—not to just extract technology, but to build the distribution infrastructure needed to do business in Japan and the rest of Asia.

Q: Can you give an example of something happening in Japan right now that evidences that change?
A: Cray Research's purchase of Supertech. Supertech has a relationship with Okigawa Electric, whereby it serves as the Japanese distributor for its supercomputing products. That's the kind of thing you'll see in the future. And a lot of U.S. companies—particularly software producers—that haven't been in the Asian market are looking for ways to penetrate it. Knowing that applications are so important, they realize they must have local talent and local knowledge [to be successful there].

Q: Who will win the battle for the information technology budgets of European users?
A: Europe is a horse of a different color because U.S. suppliers are much more comfortable there. They've been there longer. They've made a lot of inroads in that market. . . . That isn't going to change. I think that you're going to see Japanese companies working through local European entities to gain more of a share of the market. But it's going to be a slow, hard road for Japanese suppliers—really hard.

Q: So you see much stiffer competition for Europe's premier suppliers?
A: Absolutely. . . . Companies like Siemens and Olivetti are going to have to develop much better channels of distribution for information technology as the 1992 phenomenon really picks up momentum. They are going to have to establish themselves in a much broader context in Europe than just within their national borders.

Q: How much momentum does Western Europe really have?
A: It's going to be a very high growth market. But the 1992 phenomenon is not going to be a light switch that comes on. It's occurring now and will build momentum through 1996, 1997, 1998 or whenever. By the late 1990s, the economics of Europe are going to be fairly transparent through the major countries. And the big players will be present in most markets by the end of the decade.

Q: One thing European and Japanese suppliers seem to have going for them in competing against U.S. companies are regional or national industrial policies. Are U.S. suppliers at a disadvantage?
A: On any given Monday morning, yes, they can be. Are U.S. suppliers in all cases? Not necessarily, because sometimes the policy is so vague that it allows a supplier enough room to maneuver to be competitive. In some cases, that brings the best competitive actions out of the company in the United States or its subsidiaries around the world. . . .

U.S. policy, for all intents and purposes, is: Anything that can succeed is in. The fact of the matter is that the Europeans and the Asians can't as readily supply software, which is driven by application knowledge, as companies in the United States can. So that's where U.S. suppliers are successful. They also are enjoying success on the hardware side. Let's not forget that IBM, a U.S. company, still dominates computers.

Suppliers That Will Make a Difference

European, Japanese and U.S. companies that are poised to make a contribution to the industry in the 1990s

COMPANY	STRENGTHS & CHALLENGES
European Suppliers	
Cap Gemini	Well positioned to deliver application solutions
Groupe Bull	Currently a force, but government subsidization is questionable
Olivetti	Good strategy and execution, but enough resources?
Siemens	Must develop much stronger presence in Europe outside of West Germany
Japanese Suppliers	
NEC	Strong customer base, understands importance of bringing the technology into the customer's business
Sony	Understands miniaturization
U.S. Suppliers	
AT&T	Strong customer base, understands importance of bringing the technology into the customer's busi-ness
Compaq	More in sync with users than some other suppliers that are trying to force-feed users with technology
Computer Associates	Software
Hewlett-Packard	Smart in bringing technology to market
Intel	Drives the processing capability that will enable users to run new, critical applications
IBM	Strong customer base, dominant player, willing to reexamine itself, understands importance of bringing the technology into the customer's business
Microsoft	Software
Sun	Important on the engineering side and in the whole

Q: Returning to the issue of how much faster IT spending is growing outside the United States than within it, are U.S. users placed at a disadvantage by the fact that their European and Asian rivals in the last few years have consumed much more leading-edge products than those available in the United States in the early 1980s?

A: U.S. users are much smarter about applications because they got involved with applying information technology to their businesses much earlier on. . . . And to a large degree—with open systems and standards coming in now, and with a lot of applications software being ported into these new open environments—U.S. users will be able to keep up on a price-performance basis with the Europeans or the Japanese.

Q: Since you brought up the subject, how much of a factor will open systems be in the 1990s? And why should users care about them at all?

A: Open systems are happening. Suppliers are paying attention to UNIX. They are porting to UNIX. They are developing applications on UNIX. And UNIX is going to be a real force. But the concept of customer control is still extremely important, and what IBM and Digital and others are doing is figuring out other ways where they can add value to differentiate their open products—keeping them in effect proprietary suppliers to their customers. . . .

Standard interfaces give the customers more confidence to take greater risks, including bringing in new IT suppliers. That means that the dominant players are going to have to do more than just sell the users one time. They're going to have to continue to sell and support them, trying to add value all the while. That's going to accelerate the number of applications that we see out in the [end-user] environment.

Q: Switching back again to competition, suppliers often liken their market to a playing field. Is it a level or uneven one?

A: There are major imbalances. And the reason that there are major imbalances is that more and more of this business is becoming applications driven. If, for example, you have a software package that works great in pharmacies in Canada, it doesn't necessarily work great in pharmacies in the United States. The application knowledge is so crucial in that indigenous market that local companies—whether owned internationally or locally—are going to have an advantage because they can relate to the customers. They can embody the applications for those customers in a product or system that the customers can use.

Q: Applications seem to be a new element of competition. Years ago, wouldn't you have measured competitiveness in terms of which regions of the world had the best technology infrastructure, interest rates, etc.?

A: I don't want to de-emphasize the upstream technologies and their effect long term. As time goes on, you are going to see more and more of the software and application knowledge embedded in silicon [the base material for semiconductors, the brains of most computers]. As a supplier, if you don't have the silicon or access to it, you are going to be at a real disadvantage because miniaturization is one of the big drivers of new applications of information technology. Suppliers must keep reducing the footprint [physical size] of their systems and devices within them. And the way they can do that is by getting more of their software embedded in the silicon.

Q: Where do U.S., European and Japanese suppliers stand in regard to silicon and other competitive areas?

A: In terms of just raw output of silicon, we all know the answer to that—it's all in Japan. In terms of the knowledge incorporated in that silicon, it resides in the United States and Europe—particularly in the United Kingdom, where there are extremely good software development tools.

The breakthrough in software development is going to be akin to the breakthrough of going from a transistor to an integrated circuit. . . . Once we get a robust set of CASE [computer-aided software engineering] tools, a software developer won't have to write a million lines of code for an application. With the right CASE tools, all a developer would have to do is come up with 100 concepts, which a cogenerator can then turn into the million lines of code. They, in turn, can be translated into silicon, which is going to take a hundredth of the space that it takes up today. And that is what we are looking at in the decade of the 1990s. I think it's going to be that dramatic.

Q: When are we going to see this drama unfold?
A: There are going to be some major breakthroughs in software between 1993 and 1995—maybe sooner. . . .

The software and silicon developments also have implications for our communications systems because the way you are going to make applications more robust is by feeding them with more information. You have to be able to increase your bandwidth to feed information into the system, to process it and then move it back out so it can be useful. That, in turn, has implications on what our telecommunications networks are. . . .

All these things are going to make their impact, in the course of the mid-1990s . . . when we still see applications that we can hardly even imagine today—multimedia applications, large international data transfers, etc.

Q: What role will niche players have in the world of integrated applications that you describe? Are major systems companies like NCR, Hewlett-Packard and others going to ride roughshod over suppliers focused on single markets?
A: I think it's still way too early to tell. Compaq, for example, has found a very successful niche for itself in upgrading the capabilities of analysts and secretaries by bringing computing power to the desktop in a way that works the user. The customer will continue to buy Compaq if, for example, it continues to solve problems.

Q: Are you saying that users of information-technology will continue to support the small players as well as the big ones?
A: Yes. And even Compaq is even moving toward a systems [as opposed to single-user] approach. It would argue, I think, that it's moving at the pace that users are moving. As users' applications requirements go up, Compaq is more in sync with them than some other suppliers that are trying to force-feed users with technology they don't need.

Q: Is it easier for small suppliers to move upstream technologically as users' applications needs grow than it is for big-iron companies to move downstream?
A: The supplier who is going to win is the one that pays attention to the customer—figuring out where it can add value to [customers'] applications. That can be a systems guy or a box guy. But a supplier can't just have sales and marketing driving the technology, because you will never get there from here. A supplier must have an integrated approach to solving users' problems where the technologists get involved and they, in some cases, force-feed a little bit of technology to users.

Q: The leading company in the industry, IBM, often boasts of being in the solutions business. How do you think IBM will perform in the next few years?
A: IBM is taking a lot of heat . . . and has been for the last couple of years. It is, by all measures, still a dominant company in the industry—not just domestically but also in Europe and even in Japan. It is a company that has an extraordinary customer base. And it is one that is struggling with how to deal with the evolution of the market. . . .

IBM will continue to live and do well. But it's going to go in some different directions . . . It will continue to reexamine what it is and where it is going. But it's going to continue to be a very viable competitor.

Is Outsourcing Here to Stay?

Outsourcing is a topic being given increasing attention by top information systems executives worldwide. They want to know whether they should consider farming out critical IS functions to service providers. Here are Conrads' thoughts on the subject.

Q: Is outsourcing here to stay?
A: It's going to be slow to start but accelerate once several large companies do it successfully. You're going to find CEOs asking their IS directors: "Why can't we do it?"

Q: Is outsourcing a good business for an IBM or a Digital to be in?
A: Given Digital's culture and their mentality, it is going to be a big leap to get into that business—on its own . . . because outsourcing really is a different way of thinking about your business. Outsourcing is a different way of serving your customer, a different way of helping your customer think about its business. That's what makes some of these outsourcing suppliers so successful—they won't touch hardware unless it's part of the services they offer, and most don't really want to sell packaged software.

Q:Are you seeing an outsourcing in Europe or Japan?
A: In Europe, Hoskyns, Cap Gemini, Sligos and Sema are all in a position of being able to do so. But outsourcing isn't as well accepted in Europe as it is in the United States, though Cap Gemini has done a very good job in some cases with this.

Q: What should IS directors do about outsourcing? Should they embrace it as a solution to their problems? Should they try to spin out their own IS operations to form outsourcing units?
A: If you are going to create your own outsourcing business within your enterprise, it has to be an explicit strategic move that is endorsed by your parent company. . . . That's a tough decision. A lot of companies like McDonnell Douglas and General Dynamics—ones that built large data centers in the '60s and '70s to support large projects—looked at entering what today we call the outsourcing business pretty hard. In most cases, they decided not to do so. Those that did . . . haven't really kept up with the times.

Q: Other than IBM, what information-technology suppliers stand out in your mind as being positioned to make a major contribution to the IS strategies of users in the 1990s?

A: Thinking about this question from silicon up through systems and communications, I'd begin with Intel. On the semiconductor side, it's going to be a powerhouse—maybe along with Motorola. But if I had to choose one or the other, I would tend to go with Intel. It's going to drive the processing capability that will enable users to run new, critical applications.

Moving into systems, I think companies like Sun are very adaptable—even though it had a bit of a downer in its growth. Sun is going to be very important on the engineering side and in the whole workstation field. . . .

I also like Sony in that regard, because I think it is looking for a way into this whole market. These guys [who run Sony] are awfully smart. . . . They have the resources to join the [information technology] party—not only at the silicon level, but also at the product level.

Q: Do you think a company with a consumer orientation such as Sony will be in a better position to deliver the sorts of easy-to-use computer interfaces demanded by information-technology customers in the 1990s than industrially focused suppliers?

A: Yes. Sony also understands miniaturization and its effects on interfaces. . . . Sony is looking at the world from a different angle than IBM or AT&T. . . .

The Hewlett-Packard/Apollo combination also is very powerful. It's much smarter about bringing technology to market [than it used to be]. . . . It has the resources to be a player.

Q: Are you speaking of financial or human resources?

A: Both. You know, you've got to have both to be a player in this market. You have to have the resources to be able to talk to the customer and service his needs on a regular basis so he knows that you're paying attention to him. That's something that a lot of these world-class players like HP have.

Q: Who catches your eye in software and in bigger systems?

A: Microsoft is going to continue to be a force in this market. . . . So could Computer Associates.

On the large systems side, companies like NEC, AT&T, IBM—while some view them as giants that kind of slowly move along—have the staying power. They have the customer base, and they understand the importance of bringing the technology into the customer's business.

Q: Do any small supplier companies capture your attention?

A: My characterization of who's going to be around and who's going to be important tends to focus on larger companies. But that's not to say that there aren't going to be start-ups with whiz-bang products that emerge from places like Silicon Valley.

But as DATAMATION's readers make systems-oriented decisions and the impact they have on their organization's strategies, there are some suppliers whose directions they had better understand. Those are the players I'm describing.

Q: There's no European supplier on your list of companies likely to play a major role in the 1990s. Why?

A: Three that can be forces worldwide are Siemens, Philips and Cap Gemini.

Q: How about Olivetti and Bull?

A: Olivetti has got a transition to get through. It has a good business strategy, and I think its execution is pretty good. [It's just a question of whether Olivetti has the resources to accomplish everything.]

Groupe Bull is being subsidized by the French government. And whenever you have that kind of a situation, as a user you wonder when some government administration might change its mind [about staying in the information technology business]. . . . Right now, Bull is a force in the market.

Q: What are going to be the characteristics of the chief executive officer capable of leading an information technology supplier through the 1990s?

☐ IBM AND DIGITAL WILL FIGURE OUT WAYS TO DIFFERENTIATE THEIR OPEN PRODUCTS.

A: It's got to be somebody who is capable of taking risks, of pulling teams together and, yet, be hard-nosed about the decisions that have to be made as the company goes through various stages and as the environment changes around it.

In information technology, bear in mind, there are more variables changing at a faster rate than in any other industry. Technology is changing. Customer needs are changing. Capital availability is changing. Competition is changing—competitors can come out of the woodwork to challenge a CEO. And channels of distribution are changing. . . .

Such variables require a senior management team to be able to make decisions, try a variety of new things, do more of what works and do less of what doesn't work. Moreover, the team must make those decisions fairly quickly, . . . and have the resources available so that it can afford to make a mistake or two. If you're operating on a very thin balance sheet, you just don't have the resources available to make a mistake.

Q: What are chief executive officers of information technology suppliers telling you about their strategies for the 1990s?

A: A lot of CEOs are concerned about survival today. They don't know exactly how to position their companies to survive this discontinuity. The ability to capture the technology in a product and manufacture and market it on an economic scale throughout the world is becoming much more awesome. . . .

The thing that is on everybody's mind is consolidation.

Q: What will be the major trends in mergers and acquisitions for information technology suppliers in the 1990s?

A: Suppliers that merge will compliment each other either in their distribution channels, products, technologies or geographies. They will come together on a truly equal basis to create much broader-based competitors than previously existed.

Q: Are we likely to see mergers between companies from different regions of the world or within them?

A: We're going to see both types. One thing becoming more prevalent is this notion of IBM or Japanese suppliers taking equity positions in a company as opposed to buying the whole company. The reason is not just economic. It's to preserve the culture . . . of that company. You're going to see more of it because if you have equity participation between two suppliers, you have a true strategic partnership.

Q: Does intermediate integration—as some people describe these equity arrangements—make more sense for major players like IBM and Hitachi and Siemens than it does for smaller companies?

A: It makes sense for all size companies for different reasons. You can go down to the real small companies like Poqet Computer, for example, which got a big infusion from Fujitsu—30% or 40% of the equity. . . . Or you can look at big companies like IBM. IBM's investments give it access to new technology and channels that it didn't have before. And equity positions leave IBM's options open, giving it time to figure out how to shape its business over time.

Q: Are you bold enough to say that, if we think we've seen consolidating in the past, we ain't seen nothing yet?

A: Yeah. I'm bold enough to say that—particularly in the middle market. . . . You're going to see much more of a bimodal distribution of companies in the United States five or six years from now in information technology. . . .

I think you're going to have it in Europe as well, because economies of scale are necessary to take advantage of opportunities created by 1992 and by events in Eastern Europe.

Q: Can users judge these companies by just some of the financial numbers? When we look at companies, should we look for higher research and development as a percentage of sales? Or are these numbers really not valid as a judging point?

☐ The Breakthrough In Software Will Be Akin To Going From A Transistor To An IC.

A: Not entirely. The percentage of sales devoted to research and development, for example, is relative to how big a supplier's sales are and how many things it is spreading research investments across. A medium-sized company spreading its R&D dollars across too many things is much worse off than a small one focused on the product area customers are most interested in.

These percentages are flags. If a supplier is spending 1% or 2% on R&D and one of its sales representatives is telling you, the user, what a great new product set is coming down the road, you should be pretty skeptical. On the other hand, if a supplier is spending 10% on R&D, you had better understand exactly where that's being spent. It may be taking off in a direction that's not important to the user at all.

Or if a supplier's revenue per employee is way up, you should ask whether the company is squeezing back on its infrastructure costs so much that it may be unable to support customers in the future. . . .

Pay attention to return on capital investment, which answers the question: How good is a supplier at getting the capital needed for a job and being successful at employing that capital? If a supplier is consistently good at that, it's a winner. That's what causes some suppliers—like HP, Intel and others—to stand out. Intel, which is in a business that uses up cash, is good at maintaining profit margins on its new products and playing out its old products to generate the cash needed to invest in the R&D and new capital equipment needed to stay more than competitive.

Q: Looking beyond the 1989 financial performance of the industry's top 100 companies, do you see the industry growing year to year throughout the 1990s?

A: There is going to be growth. It's not going to be as explosive as it was just because the base today is bigger. . . . Worldwide, year-to-year growth will be 7 to 8% for the next five years. . . . There's still a lot of juice left here, in my view. We're not even approaching the limits of the core technologies that drive this industry—silicon, software and communications.

I can't emphasize enough what impact new networks are going to have on the industry. The supplier that can provide local area networks to a user and help the user with applying those LANs is going to be in a preferred position. That supplier is going to be channeling software. The supplier is going to probably be developing front-end [hardware or software] to match the user's applications. . . .

Being able to move large volumes of information at high speeds and compute with such information in real time is going to just leapfrog the applications. Practically speaking, right now we cannot do high-volume, real-time processing because we don't have the bandwidth to do so. But we ain't far away.

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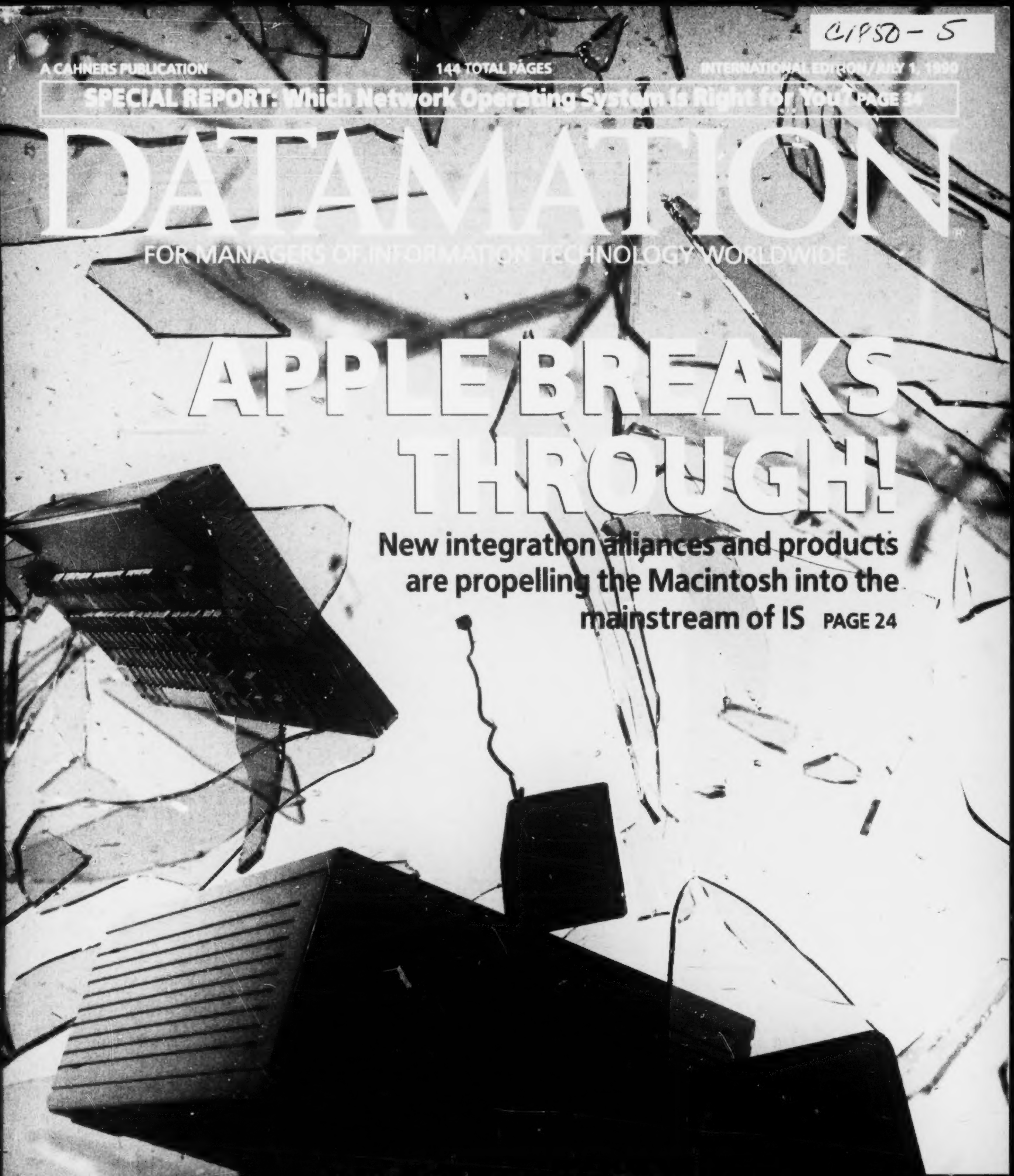

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Increased demand for integration, means the sky's the limit for Apple's James O'Gara.

Apple Breaks Through! 24

BY BOB FRANCIS AND JOHN McMULLEN More and more, IS professionals want to connect Apple computers to corporate IS systems. Apple is meeting this demand via third-party arrangements, and some users have undertaken their own initiatives.

Cover photography by Ed Braverman

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Which Network Operating System Is Right for You? 34

BY LEILA DAVIS If your organization has embarked on developing or buying client/server applications, think twice about jumping on just any networking bandwagon. Your OS/2 plans should be considered. So should your network suppliers.

This is the first of five reports on networking, part of DATAMATION's ongoing Systems & Strategies for the '90s program. The remaining parts will cover network types, servers, databases and the views of experts.

INSIGHTS ON DISTRIBUTED COMPUTING

Client/server applications allow you to execute back-end applications, instead of just transferring a whole file from the server to the workstation as is the usual case now.

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In order to have maximum flexibility, you really need end-to-end information sharing.

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It has to do with an environment that has the openness of communications, the openness of application portability, having the cooperative network computing environment and so forth. That's what openness really means.

James A. Unruh
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BY ROBERT HAMILTON AND DENNIS HAMILTON As software grows more sophisticated, its documentation grows more voluminous. Going on line with documentation is one answer to several IS problems that will not go away.

Yamaha Motor's Martin found that on-line documentation made users more fluent in their applications.

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James River's Miller prefers to stay just far enough behind the leading edge.

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BY DAVID STAMPS Some pioneering companies have plotted their strategies to take them into the brave new world of interoperability. But getting there still requires persistence as well as the right protocols and products.

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Barcelona '92: The Technological Games 107

BY ENRIQUE SAN JUAN The most obvious things about the Olympics are the athletes' skill and the thrill of the ceremonies, but, before the games can begin, behind the scenes a rarely observed technological framework of unusual complexity must be built.

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SPECIAL REPORT

NETWORKING

This is the first of five reports on networking, part of DATAMATION's on-going Systems & Strategies for the '90s Program. The remaining parts will cover network types, servers, databases and experts.

Which Network Operating System Is Right for You?

If your organization has embarked on developing or buying client/server applications, think twice about jumping on just any networking bandwagon. Your OS/2 plans should be considered. So should your network suppliers.

BY LEILA DAVIS

Relief is in sight for users of local area networks. And so, unfortunately, is confusion. New versions of operating systems to run those networks promise to solve a number of problems that previous generation products failed to correct. But differences between new network software offerings of Novell Inc. and Microsoft Corp., the two leaders in the field, may force users to make a difficult choice—one with serious ramifications for their distributed-computing strategies.

MICROSOFT BACKER MAYER pilots System One's reservation system on a LAN manager SQL server network.

Photograph by Alvis Upitis

Do users stay with Novell, the recognized king in providing software needed to link together personal computers? Or do they switch to Microsoft, whose claim to fame has been to provide the operating systems and applications for those PCs?

In large measure, the choice boils down to technology. Do users buy Novell's new network operating system (OS), NetWare 386, which will allow them to run all of the software applications built on the company's previous products? Or do they invest in the 2.0 version of Microsoft's LAN Manager, which some experts believe is better suited to the sorts of client/server applications that will be developed in tomorrow's distributed-computing environments? If users choose NetWare 386, which began shipping last August, they'll be paying $7,995—regardless of how many users are on a LAN where it's installed. If they want LAN Manager 2.0, expected to hit the streets about now, the price tag will be in the same range.

In a smaller yet significant way, the choice centers on power. While Provo, Utah-headquartered Novell enjoys a much larger installed base of customers for its networking products than its rival, the company does not carry anywhere near the clout that Redmond, Wash.-based Microsoft carries with other computer manufacturers that resell LAN Manager technology. Having companies such as Compaq Computer Corp., Digital Equipment Corp., Groupe Bull, Hewlett-Packard Co., IBM and others remarketing its product is a significant Microsoft asset—especially if users are inclined in the future to buy their networking solutions from their chief computer suppliers.

To date, users have been content to buy LANs from both network specialists, such as Novell, and computer makers, such as IBM—and they may be happy to do so in the future. Among information systems executives polled recently by DATAMATION and Cowen & Co., 31% have Novell networks today and 37% plan to have installed its NetWare products by the end of 1991. At the same time, however, users of IBM LANs intend to increase their dependency on Big Blue, whose network OS supplier is Microsoft. IBM's LAN share climbs from 27 to 34% during the two-year period.

This LAN vs. That LAN

What's more significant to IS executives, perhaps, is the degree to which their organizations will become networked, the technology that will enable such linkage and the respective roles of Novell and Microsoft in the process. Although less than half (47%) the user organizations responding to DATAMATION and Cowen & Co.'s first 1990 survey indicate they have networks in place today, fully 61% of them expect to have LANs in place by the end of 1992. What's unclear, however, is the nature of the applications such users will be running on those networks and, hence, whether one LAN technology is better than another.

"Networking is essentially in a transition stage," says David Passmore, a partner in the Network Strategies practice of Ernst & Young in Fairfax, Va. "Fifty percent or more of the people running NetWare are considering making the transition to the new generation, NetWare 386. And all those old Microsoft network users are considering moving to the next generation of LAN Manager."

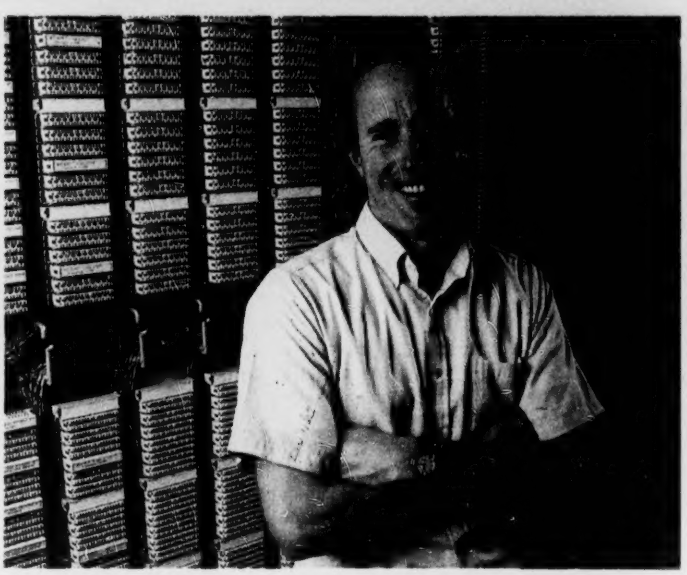
Here's what experts, suppliers and users have to say about the choice confronting IS executives as they make this important transition—one that requires them to devise or refine their networking strategies for the early 1990s.

Without a doubt, NetWare 386 and LAN Manager 2.0 represent an improvement over their predecessors. Specifically, they attempt to solve problems in the following areas:

- Naming
- Addressing
- Administration
- Directory services

As simple as naming and addressing appear to be—every resource on a network has a name, whose address corresponds to that particular network—it's a source of frustration for end users. They don't like having to log onto every other network, system or peripheral to which they desire access—the dreaded log on syndrome, if you will. What they have wanted is a single log-on, a name that gives them instant access to any resource on the network that they have permission to use.

Global naming, as this is known, will be a feature of Novell's and Microsoft's new network operating



NOVELL FAN BABBITT intends to install Netware 386 at all 25 Gates plants.

Photograph by Frank Varney/Black Star

How NetWare Stacks Up Against LAN Manager

Experts believe NetWare 386 needs to be improved quickly to hold off LAN Manager 2.0.

	Classic Strengths	Recent Enhancements	Expected Enhancements
Novell NetWare	NetWare 286: Performance Fault Tolerance Security Hardware Support	NetWare 386: Performance Application Programming Interfaces (API)	NetWare 386 v.3.1, etc. Network Naming Remote Management Application Programming Interfaces (API)
Microsoft LAN Manager	LAN Manager 1.0: Memory Protection Application Programming Interfaces (API)		LAN Manager 2.0 Fault Tolerance Security Improved Performance

Source: Ernst & Young

systems—in the future. Right now, it's offered by one of their competitors, Banyan Systems Inc., on its VINES networking family. The Westborough, Mass.-based LAN provider markets this feature, which it calls StreetTalk, as enabling end users to regard their given network as one system—regardless of how many resources (systems, peripherals and even subnetworks) there are or where they are located. In the parlance of networking, this feature is known as a single-system image.

Both Novell and Microsoft have changed their operating systems to create a single log-on, but neither have gone as far as Banyan to offer hierarchical naming. The hierarchical approach allows an administrator (the IS professional charged with managing a network) to group hosts or servers on the network into categories by using group name endings. They, in turn, can form directories that end users can access to find lists of resources grouped by type (so-called "yellow pages") and/or name ("white pages").

> It's not all gloom and doom for Novell, but it can't hang onto 50% of the market.

Both NetWare 386 and LAN Manager 2.0 will feature domain naming. This allows a network administrator to create groups of end users with the same access rights to resources. Placing them in such domains enables an administrator to make a network change (such as access to a new resource) as a group. Before this feature, such a change would require the administrator to update each end user's account individually—a time-consuming task if ever there was one. In addition to making network management a little easier for the administrator, it will also automatically allow users access to each permitted resource under the same log-on.

"It is not yet a directory service, but it will be in the future," David Thacher, senior product manager of Microsoft's network business unit, says of the domain-naming feature. "We will take the domains, group them, put them into master domains, catalog them, make them available with a utility," he promises.

Where Client/Server Applications Fit

Features like naming and directory services, though important in making network-buying decisions today, may soon take a back seat to another IS consideration in choosing LANs: How suitable is a particular network operating system to software applications specifically designed to run in client/server environments? The answer, many believe, may tip the networking battle between Novell and Microsoft in the latter's favor.

"It's not all gloom and doom for Novell, but it can't hang onto 50% of the market," says Ernst & Young's password. "Novell clearly was superior, but that's no longer the case."

In the eyes of experts, what may give LAN Manager 2.0 the edge— beyond the fact that it's being resold in several different flavors by several major computer companies—is its relationship to OS/2, the Microsoft/IBM-developed operating system on which many new client/server applications are being created. LAN Manager runs as a guest under OS/2—not alongside it as does NetWare.

The distinction is important for at least two reasons—both of which add up to the fact that it may be easier to write applications to run with LAN Manager than with NetWare. One, OS/2 (and by extension LAN Manager) is expected to attract hundreds of independent software developers to write shrinkwrap applications for it. Two, OS/2 provides the foundation for another important product in the client/server mix—SQL Server, software that acts as a database engine in driving information management on server systems.

"Client/server applications allow you to execute back-end applications, instead of just transferring a whole file from the server to the workstation as is the usual case now," says Passmore. "With LAN Man, all the applications are based on OS/2, which is emerging as a standard for networking and server duty," he continues. "With Novell's single-vendor operating system, you have to create a Network Loadable Module [NLM] written specifically to run in the NetWare environment."

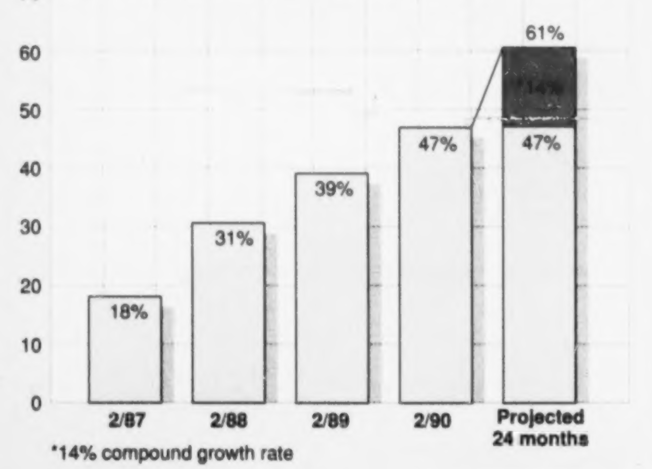
Not everybody views having to work with a separate network operating system as much of a limitation. In fact, users of NetWare praise the module feature as a major advance in networking—one they think will appeal to software developers working on client/server applications, including internal development teams. Using this technology, all network services, server-based applications and server utilities are built as modules that can be loaded or unloaded at any time without bringing down a server—or the entire network for that matter.

"We need those NLMs," states Chris Babbitt unequivocally. Babbitt is a systems engineer for Gates

Moving to Networks

Most users will have a local area network installed within a couple of years.

PERCENTAGE OF SITES PLANNING TO INSTALL A LAN



*14% compound growth rate

Source: DATAMATION/Cowen & Co.

Rubber Co., a Denver-based maker of rubber belts and hoses. Babbitt and his team of developers plan to create new cooperative-processing applications with Network Loadable Modules as Gates pursues its strategy of distributing more computer power throughout its 25 U.S. plants. Gates will soon upgrade three plants from NetWare 286 networks to NetWare 386 LANs. Eventually it will install NetWare 386 networks at all locations.

For Gates, the naming, addressing and administrative issues that plague other users have not been a problem. "We've gotten around that internally," says Babbitt. "We use the Novell SNA gateway to provide access to the IBM 8100 minicomputer at each plant and to the IBM 3084 mainframe at headquarters. The host takes care of the addressing problem, and the user can hot-key from one resource to another." Hot-keying is the ability to toggle from one application or resource to another through the use of a preprogrammed command using just one keystroke.

Much of the functionality of IBM's LAN Server 1.2 comes from OS/2.

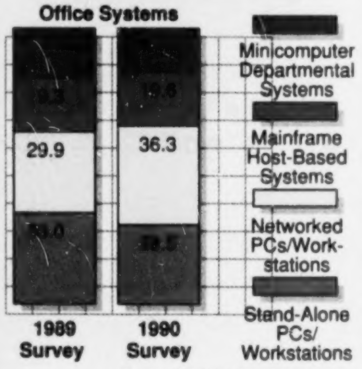
In the next three years, Gates plans to dump some machines and add others to its networks. It's going to phase out its 8100 systems, replacing them with LAN-to-mainframe communications at all plants. And it's going to add hardware and software running UNIX (for machine control applications) to the network—confident that Novell's network technology will be able to support UNIX when the need arises. (A version of NetWare 386 called Portable NetWare can and is being ported to other networking environments. Most licenses of Portable NetWare are, in fact, porting to UNIX.)

"The test for Novell will be the performance of the NLMs," agrees Hal Chapel, president of Vanguard Business Solutions Inc. His Sausalito, Calif., company builds custom client/server applications for large users, and it distributes Novell's products. He views the modules as competitive weapons—built by Novell into its networking technology to keep up with new trends like client/server applications.

Shaping Tomorrow's Office

Users are increasingly turning to networked PCs and workstations.

PRINCIPAL HARDWARE ORIENTATION OF USERS' NEWEST OFFICE SYSTEM APPLICATIONS

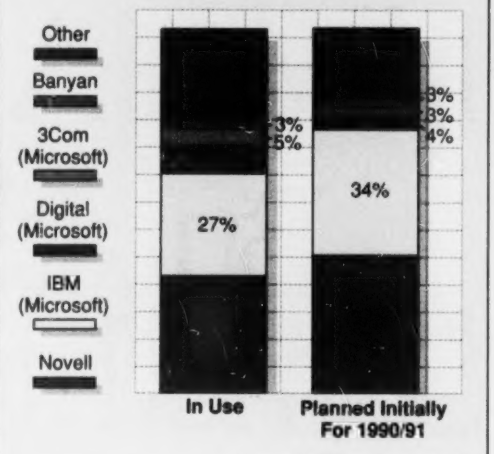


Source: DATAMATION/Cowen & Co.

Despite Chapel's relationship with Novell, he's bullish on LAN Manager's prospects. "Novell does allow you to support standard OS/2 applications," he explains. "But LAN Manager runs under OS/2 as an application, whereas NetWare is the main operating system. Therefore, LAN Manager gives you better protection—it won't crash the operating system if it goes down, but if an application crashes on NetWare, it brings down the whole server."

Becoming Network Superstars

Novell and Microsoft's OEMs are gaining ground in local area network installations at user sites.



Source: DATAMATION/Cowen & Co.

At System One Corp. in Houston, a subsidiary of Texas Air Inc., interest in Microsoft's OS/2 and SQL Server drove the company's decision to choose LAN Manager. "LAN Manager seemed like the logical choice, so we could stay with a complete Microsoft package," says Bruce Mayer, manager of application development at the System One technical center in Minneapolis. His company is currently using 3Com Corp.'s version of an earlier version of LAN Manager.

SQL Server was needed to support the massive airline information databases required for the applications operating on the company's LAN Manager network. Ten unattended personal computers run various air process applications automatically, communicating with each other and two servers. One server runs SQL Server software and the other one runs systems software

Network Travel

A typical application in System One's network is the fare assurance process. Travel agents call into the network, enter a set of travel criteria for a customer and receive information on the best possible fares that meet those criteria. Agents link into the network through a cluster of host mainframes at a technical center in Miami.

"The network has allowed us to create a minicomputer environment with PCs, so we don't have a single point of failure as with a mini. The PCs cost less, and if one PC goes down, we only lose the one piece of the client process," says Mayer.

It's not unusual to find a user of LAN Manager whose opinion of the network operating system is colored by the value that another company, usually a big computer maker, has added to it. "Some of the things that make Novell better than LAN Manager disappear when I look at 3Com," Vanguard's Chapel says. In particular, he praises the graphical network management features of 3Com's LAN Manager offering.

The strength of Microsoft's following among so-called original equipment manufacturers, computer

Users don't like to log onto every other network, system or peripheral to which they desire access.

Plugging Into the Network

If you want more information about these networking suppliers and products, please respond by using DATAMATION's reader service card.

SUPPLIER	PRODUCT	INQUIRY
Banyan	VINES	110
IBM	LAN Server 1.2	111
Microsoft	LAN Manager 2.0	112
	LAN Manager 1.0	113
Novell	NetWare 386	114
	NetWare 286	115

companies that resell its software, can't be underestimated. Not only are these OEMs big, their versions of LAN Manager often meet the needs of users operating in heterogeneous computing environments—places where there's more than one brand of computer. Digital, for example, offers a version of LAN Manager that allows users of computers based on its VMS operating system to network with systems running UNIX.

To add muscle to its OEM strategy, Microsoft has agreed to make LAN Manager one product—giving every version of it, even IBM's network, the same application-programming interfaces [APIs]. Such single-product status will allow software on any licensee's version of LAN Manger to run on any other version—something that applications can't do at the moment.

IBM has its own new generation product called LAN Server 1.2 on the way, which runs under IBM's OS/2 Extended Edition operating system. Although IBM stresses that LAN Manager and LAN Server 1.2 will become one product at the core, it doesn't mind boasting about the networking features of LAN Server 1.2. Besides making different resources on a network appear as one part of one system, IBM is offering Ethernet support without the need for a bridge, additional APIs in network management, enhanced audit trails and an increase in the number of permitted open files from 255 to 8,000.

"Additional functions come from the close synergy of the network with OS/2, which has a high-performance file system and a disk file access scheme that is much faster," says Patricia Linnon, a consulting product administrator for IBM. "Our LAN Server runs under OS/2, and much of the functionality of the network comes from OS/2."

Late Dates with Several OEMs

For its part, Novell was late in courting OEMs as resellers of its products. Most of its $422 million in annual revenues has been built on the backs of network specialists (value-added resellers and systems integrators) and distributors. But its OEM camp is growing. It now includes Data General Corp., NCR Corp., Prime Computer Inc. and Wang Laboratories Inc. And most computer makers and software developers, while perhaps not reselling Novell's products, support them technically or in a service capacity.

Users of NetWare are evolving in Novell's eyes from work group applications to true network computing. NetWare 386 is intended to address the network-computing market with its greater demand for distributed computing. NetWare 286 will continue to serve the needs of the work group market, whose primary interest is still resource sharing.

As a result of these shifts, industry analysts suggest that users take a careful look at the new generation of operating systems on two levels: how they bridge immediate functionality gaps and how they will serve the particular users' application needs over the next three to five years.

Netting Gains From NetWare

Most users of Novell Inc.'s NetWare 286 operating system are probably weighing whether they need to invest in NetWare 386 technology. Here are the thoughts of one IS professional, Dave Smith, whose organization is pondering the upgrade question.

Smith is a programmer for the city of Corvallis, Ore. His department oversees two Novell NetWare 286 networks, one at City Hall and the other within the Department of Public Works. The 40-workstation City Hall network is about to implement a third-party geographic information system that will require a dedicated database server, while Public Works has a maintenance management system on its 30-workstation network. Aside from these two major applications, however, the networks are used primarily for simple resource sharing.

If there are no surprises in performance degradation once the geographic information system is up on the NetWare 286, the city probably could stay with the network. But Smith figures that administrative issues created by the additional application may move him up a class.

"[With NetWare 286 technology], there is the system administrator and the end user and no in between. Everything has to go through the system administrator, which becomes more and more of a headache as the network grows," he complains. NetWare 386 technology, he says, offers an additional management layer—the work group manager—so a user can offload some of the administrative tasks created by network growth.

Smith also is impressed with how much more flexible NetWare 386 appears to be versus its predecessor. Changing a card, for example, on a NetWare 286 network requires a user to unplug the network, add the card and hope it starts up again. NetWare 386 technology enables a user to change cards without bringing the network down. "With the 386, you just power down the server, add the card and bring up the server again," Smith explains. "You can also disable one leg of the network for troubleshooting if you need to, instead of bringing down the whole thing."

A Mixed Year for Suppliers in Europe

Siemens-Nixdorf and Digital Equipment Corp. achieved some market share gains last year at IBM's expense, but Big Blue is still the No. 1 information technology supplier in Europe.

BY BORIS SEDACCA

The stakes are rising in the battle for IS dominance in Europe. A wave of consolidations and acquisitions is thinning the ranks of the major European suppliers. At the same time, U.S. and Japanese vendors are expanding their marketing and manufacturing resources there in anticipation of a unified Western European market and new opportunities in Eastern Europe.

The 25 companies with the largest information systems (IS) sales in Europe generated revenues of $66.9 billion in 1989, up less than 2% over the previous year. The flat growth—a remarkable departure from the torrid growth seen in recent years—is primarily due to lackluster sales by the major European vendors: International Computers Ltd. (ICL), Groupe Bull SA, Nixdorf Computer AG, NV Philips GL, Olivetti and Siemens AG.

Like their counterparts in the United States, the dominant European suppliers are struggling to adapt to the new realities of IS in the 1990s: the growing popularity of desktop systems based on standard operating systems. "The demand for IS is there, and it will increase in the 1990s," maintains Vittorio Cassoni, Olivetti's managing director. "But it's a demand for a different type of solution than in the past."

In terms of sales in Europe, Groupe Bull had the best year among the European suppliers. Its European sales grew 8.4% to Fr26 billion ($4.1 billion). Sales in Europe actually declined for Philips and Nixdorf, the latter reporting its results for the last time as an independent company, pending the final completion of its acquisition by Siemens later this year.

The weak performance of the European IS leaders in their home market is even more striking when compared with the strong results posted by several of the major U.S. vendors there. Compaq Computer Corp.'s revenues grew 63% in Europe to $1.18 billion, and Apple Computer Inc.'s European sales rose 33% to $1.24 billion.

IBM's sales growth in Europe in 1989 was not as strong as in previous years. The company's revenues there rose less than 4% to $21.3 billion. Europe accounted for 35% of IBM's total IS revenues in 1989 and some 70% of its total earnings. (IBM's U.S. earnings were reduced by the massive $2.3 billion charge against earnings that Big Blue took last December to slim down it U.S. operations.)

Although Europe has been a bright spot for IBM sales since the mid-1980s, the company has been losing market share there to its largest rivals, Digital Equipment Corp. and Siemens. But IBM is still a formidable foe. With £4.2 billion ($6.8 billion) in total revenues, its U.K. subsidiary alone is one of Europe's leading IS companies. IBM has also been active in the capital markets, raising a number of bond issues.

In 1989, IBM made it clear that it wants very much to be seen as a European company. In October, IBM chairman John Akers said the company was anxious to collaborate on the $4 billion Joint European Semiconductor Silicon (JESSI) project. JESSI has attracted wide corporate and government backing. JESSI's U.S. equivalent, Sematech, had in the past rejected membership applications from European semiconductor manufacturers, so there has been some reluctance by JESSI members to admit U.S. members. But the threat from Japan may motivate the inclusion of U.S. companies.

1989 RANK	1988 RANK	COMPANY	COUNTRY
1	1	IBM	United States
2	2	Siemens	West Germany
3	3	Digital	United States
4	4	Olivetti	Italy
5	5	Groupe Bull	France
6	6	Hewlett-Packard	United States
7	7	Unisys	United States
8	8	Nixdorf	West Germany
9	10	STC	United Kingdom
10	9	NV Philips	Netherlands
11	11	NCR	United States
12	12	Alcatel	France
13	17	Apple	United States
14	14	Nokia	Finland
15	25	Compaq	United States
16	16	Canon	Japan
17	21	Cap Gemini	France
18	—	Xerox	United States
19	19	Wang	United States
20	—	Mannesmann	[illegible]
21	—	Amdahl	United States
22	—	Memorex	Netherlands
23	—	Finsiel	Italy
24	22	Amstrad	United Kingdom
25	—	Commodore	United States

In 1989 Compaq expanded its role as one of Europe's major PC suppliers. According to Dataquest/Intelligent Electronics, a Paris-based research institute, Compaq captured 10.2% of the market for personal computers in the seven main European countries, which account for 80% of the total European market. The United Kingdom is Compaq's largest market outside the United States; next in line are France and West Germany.

Compaq employs 550 people at its Erskine plant in Renfrewshire, Scotland, near Glasgow, which the company says will be producing 70% of the machines it sells outside North America. Eckhard Pfeiffer, president of Compaq's non-American operations, says this would be made possible by a £30 million ($49 million) expansion of the Erskine plant due to be completed later this year.

Compaq also took over a former Wang Laboratories Inc. plant in Stirling, Scotland, in September 1989, seeking to create a base for international service and repair work. Initially, the plant will employ 125 people, although the company plans to take on an additional 1,000 by 1991.

Headquartered in Lowell, Mass., Wang had as troubled a year in Europe as it did in the States. Its European sales dropped 1.2% to $836 million.

Digital, Apple Thrive

Digital also has bullish plans for Europe. In August 1989, the company announced that it would invest £20 million ($33 million) in a new plant in Warrington, Cheshire, U.K., creating 500 new jobs. The development consists of a 200,000-sq.-ft. extension to its existing premises in Birchwood Science Park. Regional support manager John Horsley says that by the year 2000, Digital will employ 1,000 sales and services staff members there.

Apple's strong performance in 1989 has carried over into 1990, with its recent quarterly results boosted by European sales. In February of this year, the company appointed Soran Olsson president of its European division. Olsson replaces Michael Spindler, who was promoted to chief operating officer of Apple in the United States. Olsson had directed Apple's Swedish subsidiary since 1984. More recently, Apple promoted its U.K. managing director, Phil Chaveau, to vice president and general manager of the company's European operations. Chaveau's responsibilities will span Austria, Belgium, Denmark, Holland, Ireland, Norway, Spain, Sweden, Switzerland and Eastern Europe.

CDC Eyes the U.S.S.R.

Other U.S. companies turned in mixed performances and are actually reducing their facilities in Europe. Control Data Corp. (CDC) sold its stake in Colorado Springs-based Laser Magnetic Storage International Co. to NV Philips of the Netherlands. CDC was among the first to seek opportunities in the East Bloc. In December, CDC announced it was hoping to sell six large mainframe systems to the Soviet Union. The Cyber 962 computers are substantially more powerful than any on the list of the Coordinating Committee for Multilateral Export Controls (Co-

The Top 25 Suppliers in Europe

The top five remain stable, while six new companies rank among the biggest vendors.

1989 EUR. IS REV.	% CHG. FROM 1988	TOTAL IS 89 REV.	% CHG. FROM 1988	EUR. % OF TOTAL IS	% CHG. FROM 1988	U.S. % OF TOTAL IS	% CHG. FROM 1988	NET INCOME	1989 EMPLOYEES
21,281.8	3.7%	60,805.0	10.5%	35.0%	1.0%	43.0%	-1.0%	3,758.0	383,220
[illegible]	2.1%	6,010.6	[illegible]	90.0%	[illegible]	9.0%	-1.0%	[illegible]	[illegible]
4,915.9	11.2%	12,936.7	5.3%	38.0%	2.0%	46.0%	-2.0%	875.8	125,900
[illegible]	2.7%	[illegible]	2.7%	81.0%	0.0%	[illegible]	1.0%	147.3	[illegible]
4,073.2	5.3%	6,465.4	22.1%	63.0%	-10.0%	30.0%	9.0%	-41.8	47,332
[illegible]	[illegible]	[illegible]	[illegible]	37.0%	[illegible]	[illegible]	0.0%	[illegible]	[illegible]
2,723.1	2.8%	9,390.0	2.8%	29.0%	0.0%	51.0%	-3.0%	-639.0	82,300
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	0.0%	[illegible]	[illegible]	N/A	[illegible]
2,167.6	5.2%	2,643.4	9.0%	82.0%	-3.0%	10.0%	3.0%	288.2	36,393
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.0%	[illegible]	[illegible]
1,702.1	-3.1%	5,319.0	-0.1%	32.0%	-1.0%	42.0%	0.0%	412.0	56,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1,235.6	32.7%	5,372.3	21.2%	23.0%	2.0%	64.0%	-2.0%	438.4	14,517
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.0%	[illegible]	[illegible]	[illegible]	[illegible]
1,179.2	63.1%	2,876.1	39.2%	41.0%	6.0%	54.0%	-7.0%	333.3	9,500
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
893.8	11.6%	1,103.4	13.0%	81.0%	-1.0%	19.0%	1.0%	N/A	13,500
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
836.1	-1.2%	2,697.0	-7.6%	31.0%	2.0%	51.0%	-6.0%	-511.0	225,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
714.3	27.9%	2,101.0	16.6%	34.0%	3.0%	58.0%	-5.0%	153.0	8,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
636.0	17.8%	662.5	21.5%	96.0%	-3.0%	4.0%	3.0%	12.5	5,459
[illegible]	[illegible]	717.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
597.9	-3.6%	866.5	-6.4%	69.0%	2.0%	24.0%	-2.0%	8.3	3200

Source: DATAMATION
All currency figures are in millions of dollars.

Top 25 European Companies

Groupe Bull catapults to the top, as Siemens and Olivetti experience modest gains.

RANK	COMPANY	COUNTRY	1989 IS REV.	1988 IS REV.	% CHANGE
1	Groupe Bull	France	6,465.4	5,296.7	22.1%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
3	Olivetti	Italy	5,573.3	5,427.9	2.7%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
5	Nixdorf	West Germany	2,792.6	3,044.9	-8.3%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
7	Memorex	Netherlands	2,056.6	2,078.5	-1.1%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
9	Nokia	Finland	1,191.9	1,165.1	2.3%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
11	Mannesmann	West Germany	819.1	779.0	5.2%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
13	British Telecom	United Kingdom	692.5	N/A	N/A
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
15	Racal	United Kingdom	573.9	554.1	3.6%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
17	SD-Scicon	United Kingdom	431.5	366.4	17.8%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
19	Sema Group	United Kingdom	378.6	375.1	0.9%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
21	Logica	United Kingdom	314.0	269.9	14.0%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
23	GSI	France	277.1	262.8	5.0%
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
25	Dowty Group	United Kingdom	216.6	N/A	N/A

Source: DATAMATION
All revenue figures are in millions.

Com). The machines were ordered by the Soviet Research and Development Institute of Power Engineering for running safety analysis software from the Vienna-based International Atomic Energy Agency.

Unisys Corp. also had a difficult year in Europe, with sales rising less than 3% to $2.7 billion. However, the company got off to a strong start in 1990, winning a $47 million mainframe upgrade order from the German air traffic control system.

Groupe Bull, Siemens Square Off

As the 1990s begin, the indigenous European computer industry finds itself in the middle of a large-scale restructuring.

Groupe Bull's recent acquisition of Zenith Data Systems Corp. of Santa Clara has put it in contention with Siemens for first place in the European computer market. Yet the company reported a 1989 loss of Fr267 million ($42 million), the first time in three years it has fallen into the red. The slippage was due to a combination of printed circuit board production difficulties, the dollar's unexpected strength and heavy restructuring costs.

In its aim to behave more like a single European company, Groupe Bull will be split into four units—Bull SA France, Bull International SA, Bull HN and Zenith Data Systems—all reporting to Compagnie des Machines Bull.

☐ **LACKLUSTER SALES BY MAJOR EUROPEAN VENDORS RESULTED IN FLAT 1989 REVENUES.**

In April, Germany's Federal Cartel Office gave the go-ahead for Siemens to acquire 51% percent of Nixdorf. The new company will be called Siemens-Nixdorf Informationssysteme AG. Prior to the acquisition, Nixdorf had run into trouble due to what analysts say was a combination of overconfidence and lack of foresight to capitalize on emerging open standards. The company had spent heavily but unsuccessfully in fast-growing sectors where intense price competition was putting great pressure on margins. In February, Nixdorf announced it would lay off a quarter of the work force at its Bray plant in Ireland and was negotiating to sell the factory.

Many analysts and industry experts believe the Siemens-Nixdorf merger signals the start of a wave of mergers and acquisitions that will drastically change Europe's computing landscape.

In January, Siemens put Hoskyns, a leading U.K. computing services company acquired during the General Electric Co./Siemens takeover of the Plessey Co. PLC, on the market, but no buyers have come forward so far. A series of GEC/Siemens joint ventures has now been abandoned.

Ups and Downs at Olivetti

Italian computer giant Olivetti did not have a very happy 1989. Net income fell 43% to L202.8 billion ($147.3 million). Its European sales rose 8.2% to L6.2 trillion ($4.5 billion). The squeeze on earnings at Olivetti is primarily due to its fierce competition with IBM and Compaq in the PC market.

1989 also saw an end to the six-year "global alliance" between Olivetti and AT&T. In July, AT&T liquidated its 22.35% stake in Olivetti for $850 million.

There were some positive developments for Olivetti last year, however. In July, the company announced that it had won one of the single largest contracts for banking automation systems ever awarded. The deal, for L500 billion ($365 million) worth of networked minis and PCs, came from the Dutch Rabobank group, based in Utrecht, the Netherlands. In October, Olivetti launched its new "Computing Platforms" based on the Intel 486 and 860 processors.

A possible benefactor to Olivetti is Nokia Data AB, part of the Finnish Nokia industrial conglomerate, which brought in a top Olivetti man, Vittorio Levi, to take over as president.

A long-standing member of the Olivetti board, Levi joined Nokia Data in March of this year and will act as senior executive vice president for operations until December when Kalle Isokallio, who was appointed deputy to the chief executive of the Nokia group in January, relinquishes his post of president.

Shake-up at Philips

The poor performance of Philips' computer business played a significant role in the management shake-up at the Dutch company in May of this year. President and chairman Cor van der Klugt is out, along with G. Lorenz, who was head of the computer division and a member of the Philips board of management. The shake-up was announced following a steep and unexpected decline in the company's first-quarter profits. The poor financial results came only a few weeks after van der Klugt had predicted that 1990 would be better than 1989. Reports that Philips is trying to buy a majority stake in Olivetti were denied by the Italian computer maker. Olivetti representatives say their company is discussing cooperative ventures with several electronics and computer companies, including Philips, but that "there are no talks about a shareholders' agreement."

Results from the U.K.'s information technology companies are mixed. ICL, the U.K.'s leading computer manufacturer, still appears to be the tail that wags the dog, having turned in a 13% increase in 1989 profits of £145.7 million ($238.3 million) on revenues of £1.6 billion ($2.6 billion) for its London-based parent, STC PLC.

But STC chairman Arthur Walsh is said to be looking for a partner for ICL to help spread research costs. When the 1989 figures were announced, Edmund Fitzgerald, chairman of Northern Telecom Ltd. in Mississauga, Ontario, turned up to deny reports that his company intended to sell its shares. Northern Telecom holds just over 27% of STC.

Amstrad PLC suffered a poor year, with sales of its PCs dropping more than 7% to £438 million ($716 million). Amstrad's move in 1989 into professional PCs based on Intel 286 and 386 processors was dogged by quality problems, culminating in the recall of 7,000 PCs. The company launched two new Japanese-manufactured laptop PCs this March.

Unlike their hardware-oriented counterparts, European software and services companies posted very strong results in 1989. Finsiel SpA, the Italian software and services firm, boosted sales by 28% to L908.7 billion ($662.5 million).

Cap Gemini Sogeti saw improved margins in 1989; sales grew 21.2% to Fr7.04 billion ($1.1 billion), with a net profit of Fr525 million ($82.3 million).

The company made no large acquisitions last year but added a number of small U.S. and European computer services companies to its portfolio. In January it issued a Fr1.5 billion ($235.1 million) convertible bond and is regarded as a buyer of some of the leading information services companies on the market.

Boris Sedacca is a freelance technology journalist based in London.

IBM's Seven Major Sources of Revenue in Europe

West Germany remains IBM's biggest market in Europe.

COUNTRY	1989 IS REV. ($ MIL.)	LOCAL IS REV.	% CHG. FROM 1988	TOTAL REV.	% CHANGE	NET INCOME	% CHANGE
West Germany	4,461.2	DM8,387	14.2	DM12,391	9.0	755	17.1
France	3,634.7	Fr23,190	15.2	Fr47,336	[illegible]	2063	10.8
United Kingdom	3,451.1	£2110	21.0	£4,192	8.0	295	-9.8
Italy	3,134.6	L4,320,000	10.3	L7,400,000	12.6	N/A	N/A
Spain	1,302.4	Pta154,203	16.7	Pta211,784	13.2	26236	22.6
Netherlands	1,065.9	G2,303	23.8	[illegible]	[illegible]	250	37.0
Sweden	844.2	Skr5,442	11.2	Skr10,152	12.5	459	15.6

N/A– Not available
Revenue figures are in millions; all exchange rates are OECD average rates for 1989.
Source: IBM Europe, Paris

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- Programmers/Analysts.

See Career Opportunities beginning on Page 121

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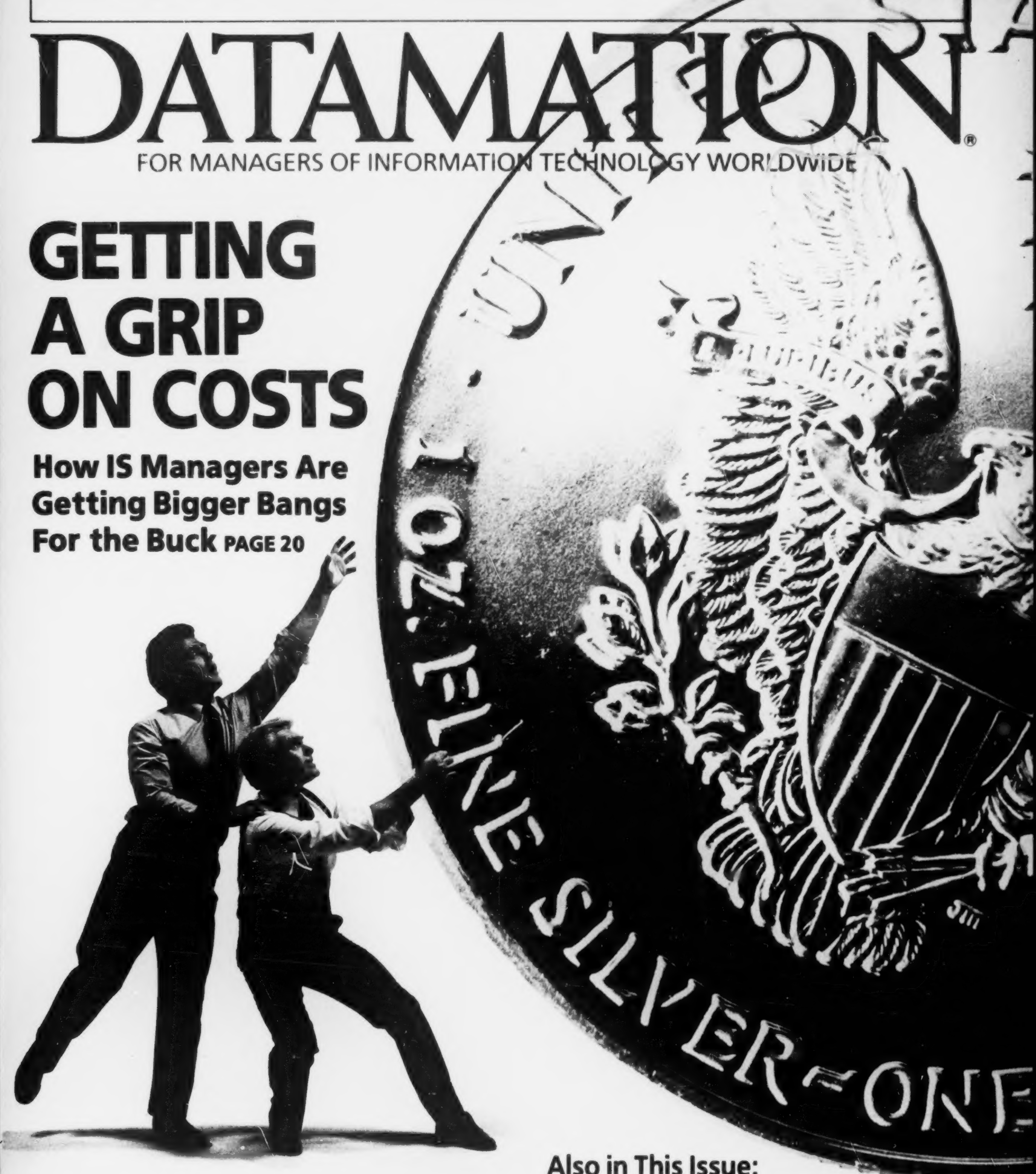

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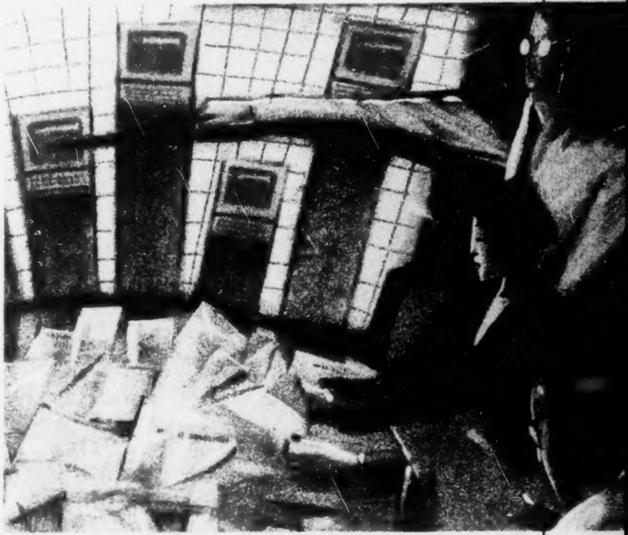

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The Challenge Of Integration

Image technology keeps getting better, but building image applications remains a considerable challenge. At issue is how to integrate tomorrow's imaging systems with today's business-critical applications.

BY DAVID STAMPS

Image-processing technology is on a fast track these days. The pace of new product announcements alone should be enough to make information systems managers pay heed. High-resolution monitors that use as many as 3 million pixels to paint pictures of stunning crispness are available. So, too, are faster and cheaper laser printers and scanners. Optical storage subsystems—the generally favored means for storing electronic images—continue to raise the limit for data storage. Sony Corp., for example, offers a 12-inch disc that holds 3.75 gigabytes of data per side. And 5¼-inch optical jukebox systems are proliferating like rabbits.

Data transfer from an optical disc is still slower than from a magnetic disk. But here, too, new advances promise to close the gap between optical and magnetic data speeds. New compression/decompression algorithms can squeeze the image for a standard paper document from one megabyte down to less than 50 kilobytes.

Songs of Solution

Such an outpouring of technology has the imaging industry bustling with excitement. But what excites many IS pros even more is the fact that it's now possible to tie together these various components into imaging applications that offer enormous returns. Instead of harping on technology, the image industry is suddenly singing songs of solution.

All of this marks a significant change. Not so long ago, imaging was, in the words of one IS director, "a technological curiosity." Image processing tended to be used in stand-alone applications, usually built around the task of document storage and retrieval, an application for which the technology is well suited. But the real returns from imaging won't happen until systems begin to eliminate the physical flow of paper in a company. And without software to replicate work flow or to link imaging to other existing applications built on years of IS effort, an image system is scarcely more than an expensive filing cabinet.

Image systems are starting to live up to their potential to integrate electronic document handling with other business critical applications, however. Consider the case of St. Paul-based Northwest Airlines Inc., which is using image technology to tackle a job that, until recently, defied automation. Northwest, the nation's fourth-largest air carrier, processes over 600 million ticket transactions a year.

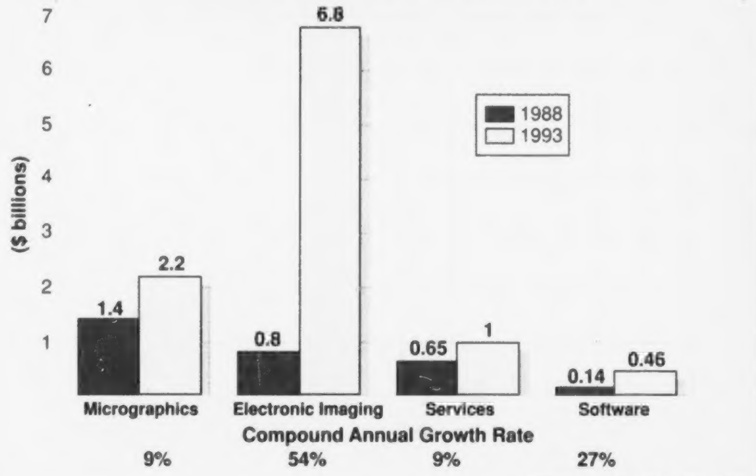
The front end of the ticket business is sufficiently automated. Electronic records of every ticket sold by a travel agent or one of Northwest's own 60,000 ticket agents go directly into an IBM mainframe database. The back end of the ticket accounting system, however, was anything but automated. When passengers turned in tickets, the flight coupons were stuffed into envelopes by gate agents and shipped back to Northwest's headquarters. There they were stored in a warehouse stacked to the ceiling with cardboard filing boxes.

The problem facing Northwest—and every other airline—stemmed from the

BRISTOL MEYERS' GILSON started out with a nonstrategic imaging application as a way to minimize risk in case of failure.

The Imaging Market Is Looking Good

Electronic-imaging sales are expected to grow a breathtaking 54% each year over the next five years.



Sourco: Temple, Barker and Sloan

fact that passengers use tickets in a way that bears only a passing resemblance to the electronic records housed in the ticket database. They may use a ticket from one airline to fly with another, or they may use only the A-B leg of an A-B-C flight. Because of the discrepancies between original ticket records and actual ticket use, airlines need to match every flight coupon in the warehouse against every ticket in the database to accurately calculate passenger revenues.

Deregulated Complications

Further complicating revenue accounting is the deregulated airline environment, in which daily price changes can affect as many as 1 million tickets. Given the number of passengers carried by Northwest, a manual match for every ticket was clearly impossible. "Instead, we took a sampling of tickets and used a statistical-modeling program to essentially estimate revenues," explains Harold Atkins, assistant controller at the airline.

But this shortcut left much to be desired. For one thing, revenue estimates were not always accurate. Nor did they alleviate the paper problem, since tickets still had to be physically tracked down in the warehouse and pulled each time a fare refund or interairline transfer was required. Of the 600 people employed in Northwest's passenger revenue accounting office, 20 did little else but search for flight coupons.

☐ INSTEAD OF CHASING PAPER, WORKERS WILL BE REASSIGNED TO MORE USEFUL JOBS.

So, in 1986, following its merger with Republic Airlines, Northwest realized it had to streamline the process. It hired Chicago-based Andersen Consulting to design an automated Passenger Revenue Accounting (PRA) system. The assignment proved to be an archetypical systems integration job: by the time Andersen sought out the best components for each system element, at least 10 vendors were involved.

From an imaging standpoint, a key element of the PRA is a scanner from Recognition Equipment Inc. of Irving, Texas, that was specially engineered to read 17 tickets per second. Once the ticket images are captured and indexed by ticket number, the images are stored in an optical storage and retrieval library from FileNet Corp. of Costa Mesa, Calif. The optical library consists of two jukeboxes, each containing 204 twelve-inch optical discs and can house a maximum of 40 million documents.

Another key element of the PRA system is a network of workstations from Sun Microsystems Inc. used to access ticket images. Each ticket number is scanned by optical character recognition (OCR) software and then sent to a Sun fileserver. The system uses the relational database management software from Sybase Inc. of Emeryville, Calif., to keep track of the location of each ticket image in the FileNet library.

Special audit software from Los Angeles-based Inference Corp. matches the ticket image in the library with ticket records on the mainframe database. For those cases where audit errors are detected, the ticket in question is fetched from the FileNet library and put in a queue to await further auditing by operators working at the Sun workstations. "The ticket retrieval process—which used to take hours—is now done in seconds," says Rachel Hollstadt, director of the PRA system.

Northwest's application is being touted by some as a vision of the imaging future. "Historically, image applications have been confined to document management with some limited connections between the document storage system and host data," says FileNet's vice president of marketing, Bob Castle. "The [Northwest application] represents a much broader use of image. Different databases, different data types, expert systems, a number of different software technologies are all tied together at the workstation level using a client/server, open systems architecture."

For IS directors contemplating image applications, Northwest's PRA does indeed illustrate the technology's potential. But it also serves to highlight some of the scarier aspects of integrated image systems today. For starters, there is the matter of sticker shock. Northwest won't disclose the cost of the system, but educated guesses put the total tab in the range of $50 million, counting hardware, software, development and training costs.

While not acknowledging the accuracy of the $50 million estimate, Doug Schwinn, then senior director of IS development at Northwest (he has since moved to Dayton Hudson Corp.), who headed up the project, says the cost figures merit some qualification. The total PRA system includes a number of pieces, he says, including a new IBM mainframe and specially developed accounting software to run on it. To that add the costs of expert system audit software and an upgraded data center network. According to Schwinn, the parts of the system directly related to imaging account for only about 10% of the total cost.

By another measure, the image portion of the system—including scanners, workstations, network and servers—comes to about $11,000 per workstation, according to Tom Grudnowski, the partner at Andersen Consulting who led the PRA project team.

Price appears not to be a major concern to Northwest: the airline expects to recoup the costs within the first year through greater employee efficiency and other savings. "Instead of chasing paper, workers will be reassigned to more useful jobs, such as doing audits," explains PRA director Hollstadt. An even greater payoff will come in the form of improved market intelligence. "For the first time, Northwest will be able to know what its true customer base is and where those customers fly," says Schwinn.

There is another aspect to the Northwest system that may give some IS directors pause, and that is the amount of customization required. At the point of peak activity, some 180 people worked on the PRA system. Many of them were part of the software development effort to build in auditing features and integrate the image capture and storage system into the mainframe ticket database. But a sizable chunk of development time was also devoted simply to tying the various hardware pieces together. "One of the biggest challenges of the project was to get all the components running at the speed of the scanner," admits Schwinn.

☐ **EXPERTS AGREE THAT STANDARDS ARE NO LONGER A MAJOR STUMBLING BLOCK.**

The Integration Question

Integration—how much is needed and at what cost—is a major question in the imaging arena these days. How much customization work is needed to make image technology fit an organization's needs? Depending on the particular application, the answer can be a lot, as the Northwest system shows. But even less-specialized applications will generally require the assistance of a systems integration company.

"There is no single-product company today that gives an optimal solution," says Brendan Reidy, vice president and general manager of Litton Integrated Automation in Alameda, Calif., one of a number of integrators doing a brisk business in building large imaging applications. Reidy points out that for a large imaging system—$10 million and up—roughly one-third of the final cost typically goes to the systems integrator for consulting and integration work. Integration fees often include the programming of entirely new applications or, at the very least, software to link the image system to an existing application.

In many cases, more fundamental integration problems need to be solved. Depending on the needs of an application, it may be necessary to write device drivers for printers, scanners or optical disc systems just to link the various imaging components together. Then there is the issue of linking the imaging components to other computers and databases.

Who Needs Imaging, Anyway?

In 1987, J.C. Penney Co. Inc.'s Credit Division in Dallas decided to consolidate from 13 new account application centers across the country into just three. The plan hinged on the use of image processing to eliminate the flow of paper. "It would have been tough to consolidate without image; it would have meant a lot of people under one roof," says project coordinator James Worthy.

But even before moving to the image-based new accounts system, Penney had already realized substantial benefits from imaging technology. Using an image-based remittance-processing system built in the mid-1980s by TRW Financial Systems Inc. of Berkeley, Calif., Penney routinely handles over 11 million items a month. Yet its labor force is 40% smaller than the older, nonimage system required.

Based on this success, the company is moving ahead with plans to expand its use of imaging. In addition to the image-based new-accounts applications, Penney is planning to install a document image system for all customer correspondence. "Image has been very successful for us; we have a lot of confidence in the technology," says Worthy.

Buoyed by reports of this kind of return, some industry observers are predicting a surge in image processing. In a study for the Association for Information and Image Management (AIIM), Temple, Barker & Sloane Inc. (TBS), a research firm in Lexington, Mass., estimates that the market for electronic-imaging systems will grow at a compound annual rate of 54%. "Electronic imaging may not be the hottest growth market, but it is right up there with some of the hottest, including fax machines, cellular phones and engineering workstations," says Mark Bruneau, a senior associate with TBS.

Other analysts predict the market growth will be slower, limited to high-volume applications such as J.C. Penney's remittance system. "My own guess is that there is something in the neighborhood of 600 high-volume, transaction-processing types of applications that can really justify the cost of a $4 million image system," says Stuart Woodring, director of software strategy for Forrester Research Inc. in Cambridge, Mass.

At $10,000 and up for a high-end imaging workstation, it's tough to cost justify many desktop or departmental image systems. Even image vendors concede that the cost of workstations will have to come down before imaging storms the office the way personal computing did.

The real market for imaging is probably outside the office, in industries such as printing, publishing and health care, says Lawrence Matteson, vice president and general manager of Eastman Kodak Co.'s Imaging Information Systems Group in Rochester, N.Y. At the same time, Matteson believes it may be hard to keep imaging out of the office. "Look what happened to fax. It exploded when electronic mail became available because people wanted images, not ASCII characters."

For now, would-be image users are having a tough time finding image systems at departmental or work group prices. "What we have are a number of departmental problems that could be solved very nicely by image," says Alan Gilson, director of technology assessment at Bristol-Myers Squibb Co. "What we don't have are a lot of high-volume applications that can justify bringing image in at a cost of several million dollars. But so far no one has quoted us a system that does what we need for a price we can afford."

For a number of years, standards for optical storage—or the lack of them—were a subject of concern, with discussion typically focusing on such things as data compression/decompression standards and optical-writing techniques. Today, many experts agree that standards are no longer a major stumbling block. Standards for compression/decompression do exist, and standards for interchange of data among optical systems are developing.

To what extent vendors will support these standards remains a valid concern. But whether vendors go their own way on things like compression/decompression and optical writing is not the major hindrance to integrated imaging.

"Data formats for optical disc are irrelevant," maintains Roger Sullivan, vice president of image management systems at BIS/CAP International, a market research firm in Norwell, Mass. "Most customers are making decisions well beyond the question of what are the nuts and bolts of data format or whether they can move data from one optical disc to another. Integration within the data-processing environment is the primary concern. What customers really want is to intercept the data stream on the host or to have the host system automatically retrieve documents from an image system and do something with it."

Even a modest imaging project can easily run into difficulties. For instance, piecing together the various hardware and software elements can be especially problematic. Two years ago, Bristol-Myers Squibb Co. of East Brunswick, N.J., undertook a project involving the conversion of all internally developed research and development documents in its Princeton, N.J.-based Research Information Center (RIC) from microfilm to an optical storage and retrieval system.

Risk-Free Conversion

One reason for doing the project was to learn more about the technology. "Down the line, we have some ambitious plans for image, but this [project] was not one of them," says Alan Gilson, manager of the firm's Technology Assessment Group. Gilson terms the RIC project a production pilot that "posed no real risk to the company if the conversion failed."

Just as well, because, says Gilson, "what we learned is that integrating image is a lot more difficult than it needs to be." For example, problems cropped up when the implementers tried to use a session number from a database management system running on a VAX minicomputer as an index number to access an image document. "Sun workstations offered an implementation that was better than other vendors," says Gilson. "Even so, it was clumsier than it needed to be. Operators have to use Sun tools to transfer from the DEC terminal to an imaging session on the Sun server. That should be an automatic transfer; it shouldn't require human intervention."

How long will it take image vendors to develop the kinds of integration that users want? The answer depends on whether this technology truly poses unique challenges or whether it can benefit from the steep learning curve that other IS technologies have followed.

Some experts believe that image applications do pose special challenges. "Architectural issues for image are very different than for data," says Scott McReady, director of image systems for IDC/Avante, a Framingham, Mass., research firm. "They are much more complicated than most users, or many vendors, realize. One vendor may use a proprietary server architecture to handle high-volume I/O; another may opt for a different solution. Then there's a whole host of back-end storage issues and workstation design issues." According to McReady, the solution for one application will generally not be the optimal solution for another.

But this view is not shared by all—and certainly not by the image vendors. "I don't believe image technology requires a higher degree of customization than other new technologies have," asserts David Sarna, president of New York City-based Image Business Systems Inc. "But image is new technology, so people are puzzling through how to implement it with existing technologies. That means they often come up with a detailed requirement that isn't necessarily the ideal solution. It just happens to be the way they solved the puzzle."

Prevailing Platforms

Sarna predicts that, over time, a small number of accepted image platforms and approaches will prevail. He offers the analogy of building one's own database management system: "Today you'd have to be out of your mind to even consider it, but several years ago it was thought to be a reasonable question."

The challenge of piecing together imaging solutions has mainly fallen to systems integrators, many of which have standardized on a particular set of products that they use as a basic imaging platform. Litton Integration Automation, for instance, typically uses as its solution a standard platform consisting of an IBM mainframe, Sun workstations, a high-speed fiber optic backbone and a mix of printers and scanners.

> ☐ Instead Of Harping On Technology, The Image Industry Is Singing Songs Of Solution.

The image vendors now appear to be following this lead by offering standard solution platforms, mainly through a flurry of vendor alliances. Image Business Systems, for instance, offers a package consisting of IBM RT workstations (to be replaced by RS/6000s later this year); optical drives from Laser Magnetic Storage International Co. of Colorado Springs; jukeboxes from Cygnet Systems Inc. of San Jose; OCR scanners from Santa Clara-based Calera Recognition Systems Inc.; Ethernet, Token Ring and fiber-optic networking solutions from a variety of sources; and IBS' own bar code software.

Indeed, there appears to be a real scramble to form alliances. Unisys Corp. recruited at least 10 suppliers—including FileNet, Plexus Software Inc. (also in Santa Clara) and Sigma Imaging Systems Inc. of Anaheim, Calif.—for its general purpose imaging product called InfoImage Folder, introduced earlier this year. Similarly, IBM offers a set of its own and third-party products as building blocks for its AS/400-based imaging system. "We think this approach takes a lot of complexity out of the equation for the customer," says Craig Grant, IBM's manager of AS/400 market development specializing in image applications.

With imaging technology moving so fast, the vendor alliance approach represents in some respects a compromise solution. "We've got a platform that offers basic functionality, but if you have an application that needs the latest and greatest and fastest of a certain type of device, we may not support it today," says Grant.

Of course, there is no guarantee that the rash of vendor alliances will meet the specialized needs of many potential customers. David Coldren, executive director of the Illinois Criminal Justice Information Authority, has a case in point. "I've watched the technology get better and better, and now I'm seeing vendors and systems integrators put the pieces together. But no one has put them together in a system that meets our needs."

What Coldren has in mind is a unique system for storing and retrieving electronic images of court records. It would need to be a big system, he figures; Illinois has millions of court records on file, and the file for the average felony case is 3 inches thick. "There's a lot of information in those files that could have relevance to other criminal cases, if only we could get at it," says Coldren.

The bureau currently stores court documents on microfilm. Optical storage would improve the retrieval time for entire cases, but it still would not allow for key word retrievals based on the information contained within scanned documents. As yet, few vendors have linked OCR technology to imaging in a way that can accomplish this feat. Moreover, an indexing system that could keep track of all the names, aliases, dates, times, places and other data that might be relevant to a criminal prosecutor would be challenging to build. "We've talked with systems integrators," says Coldren. "They are doing some interesting things. But hiring a systems integrator to invent the missing pieces is too expensive." Nor does systems integration lend itself to the needs of a public agency, which typically must be able to point to a specific product before it can secure money from funding agencies.

"It's nice to see that the imaging pieces are starting to be assembled into vertical solutions," says Coldren. "It just doesn't look like ours is going to be one of the target markets anytime soon." ▭

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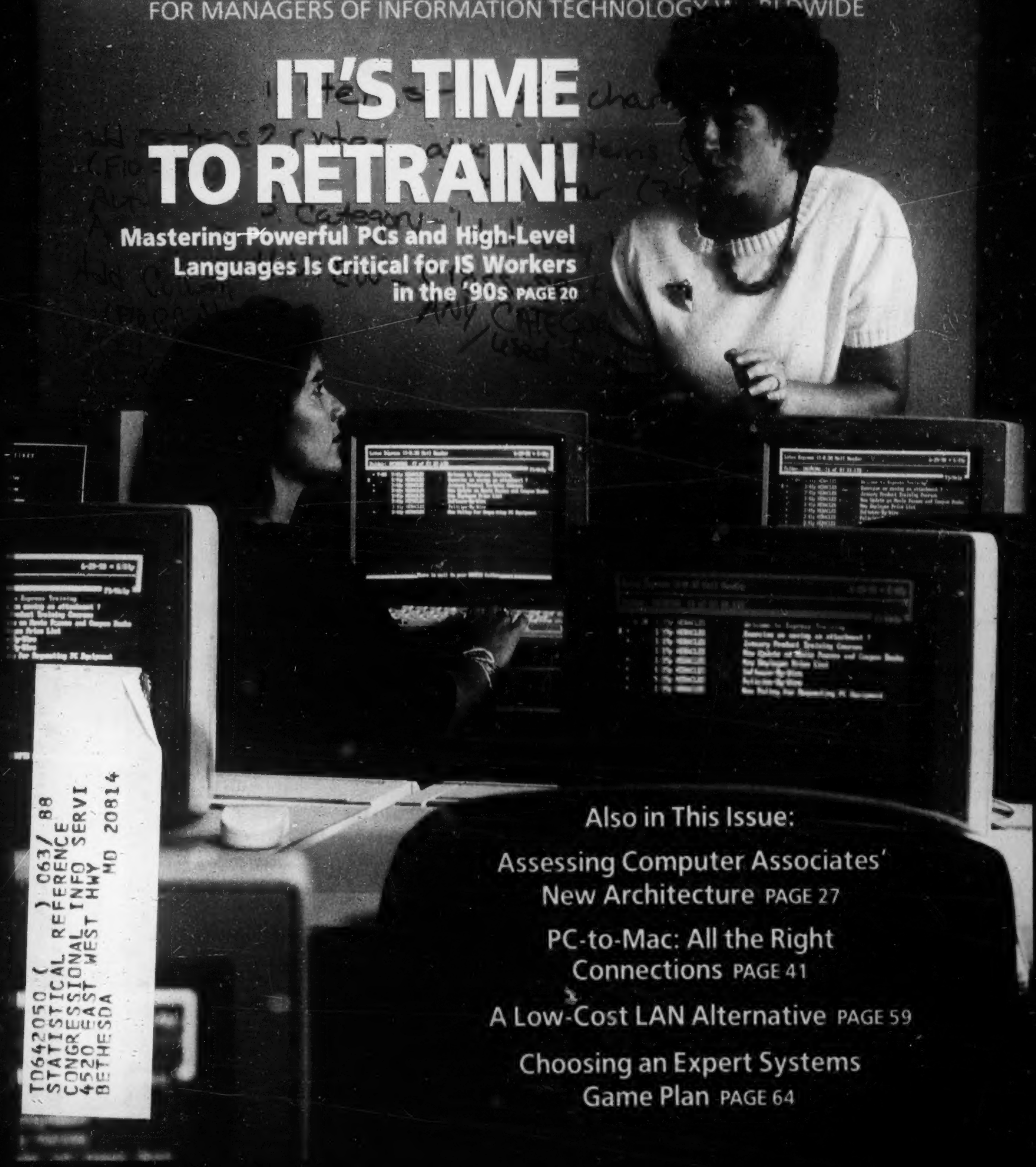

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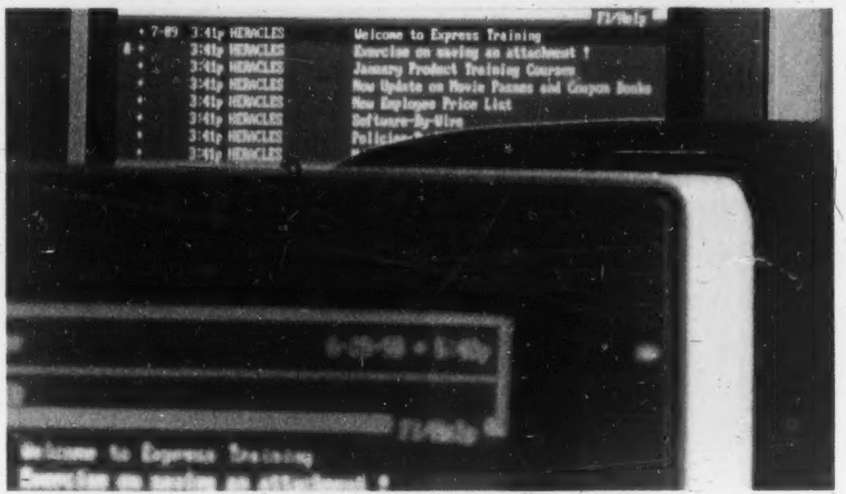
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The big picture comes clearer to IS workers: Back to the classroom!

It's Time To Retrain! 20

BY JEFF MOAD New technologies and applications require new skills. But where will they come from? Veteran IS workers who don't retrain may be replaced by new talent.

Cover photography by David Bradley

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Assessing Computer Associates' New Architecture 27

BY RALPH CARLYLE Just when you thought you understood the difference between SAA and NAS, along comes another architecture—CA90s. Like the blueprints from IBM and Digital, this one from Computer Associates offers more promises than products.

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BY CHRIS SIVULA As hardware companies take a downturn in Massachusetts, many former employees are turning to software development. A software start-up, they've found, requires little overhead. All you need is a computer, an idea and a garage.

INSIGHTS ON DISTRIBUTED COMPUTING

We just left his NetWare 286 server in place on the network, attached and logged the Macs into that, and used the 286 server as a router to the 386 server.

Mike Drake
Evernett Network Resources Inc.
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We're trying not to make computer use a religious battle. We support DOS, Macintosh OS and UNIX and attempt to let each person use the paradigms they're accustomed to.

Anthony Torti
Brown University
PAGE 41

Our real focus is connectivity and communications, not sheer processing power. We are moving in the direction of networking wherever we can to share and standardize our applications.

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BY DONNA BARON Macs and PCs haven't always been on speaking terms. While today's networking solutions have both systems at least on the same wavelength, there are still a few glitches and gotchas that remain.

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BY LEILA DAVIS Network specialists say that the variety of transmission media available has enabled users, whatever their needs, to choose the best option for each job with a minimum of trade-offs.

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A Low-Cost LAN Alternative 59

BY JOHN McMULLEN Conventional wisdom casts doubt on the prospects of multiuser PC computing on anything other than LANs. But a few radical souls have found another solution that costs less and often performs just as well.

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BY JEFF MOAD They said it couldn't be done, but Mike Simmons turned Bank of America's volatile IS operation around after four guys went down trying. Now on his way to Bank of Boston, he takes time out to give IS managers a piece of his mind.

Simmons dares top IS management to come out of the glass house.

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The Huffin' and Puffin' Is Worth It

In my younger years, I never believed the old guys who wagged their fingers at me and said that someday my midsection would sag, my eyes would droop and the hairs on my head would thin and turn gray. Why should I have believed them? I was young and indestructible, and I could only foresee my condition as I had always enjoyed it. I was a lean, mean, fighting machine, and I figured I'd always be so.

But the old wags were wise, and I guess that's how they got to be old wags. As the years went by, I learned how easy it was to fall into disrepair, that comfort was a danger sign and that the value of change was renewal. I had to stay in shape to meet the challenges of tomorrow. And it's a lesson that's particularly applicable in our industry today. For IS men and women, the challenge is to keep skills in shape in the face of rapidly changing technologies and individual company's organizational requirements. In many companies, it's a question of either shaping up or possibly shipping out.

TRAINING MOAD

Photograph by David Bradley

As senior writer Jeff Moad says in our cover story this issue, "It's Time To Retrain!" p. 20, "In the fast-moving world of information systems and technology, it has always been a challenge for programmers, analysts and managers to keep their skills up to date . . . In the past, those workers may have been shifted into software maintenance jobs or even kicked upstairs into middle management positions that justified their higher salaries. But times have changed. Most IS executives are facing tighter budgets and pressure to downsize and flatten organizations. That means less room for middle managers in IS."

What it really means is that the onus is on you to develop the skills and expertise needed in the years ahead. You've got to get in that fighting spirit. Go lean! Go mean! Tone up those portable operating system abdominals! Pump those graphical user interfaces! Loosen up those LAN back muscles! As Tommy LaSorda says, "If I can do it, you can do it." It may take some huffin' and puffin', but in the end you may just end up one of those wise old wags.

Of Architectures and Network Media

What the world's largest independent software company does, or does not do, is just about always important to information-processing professionals. When Computer Associates International Inc. rolled out its CA90s architecture to link together many of its system software products, we figured we'd better take a hard look at it. In exploring Computer Associates' new architecture, senior writer Ralph Carlyle reaches some interesting conclusions. Turn to page 27 for Carlyle's assessment. And in the latest installment of our continuing series, Systems & Strategies for the '90s, contributing editor Leila Davis takes a look into the world of network data transport media. In "No More Manic-Media Choices," p. 51, Davis reveals that things have gotten a whole lot better for users.

David R. Brousell, Editor

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Mass. Miracle Goes Soft(ware)

As hardware companies take a downturn in Massachusetts, many former employees are turning to software development. A software start-up, they've found, requires little overhead. All you need is a computer, an idea and a garage.

BY CHRIS SIVULA

Tonight, in some cramped office near Boston, a couple of software developers are working late. They are a fledgling company's only employees, its sole officers and its lone asset. Revenues coming into the company's coffers total exactly zero.

By the end of the decade, they'll both be millionaires. If their company's name isn't a household word, its software will at least be well recognized in whatever niche it's aimed at. It's possible, perhaps likely, that the code they are writing will become an industry standard and will have a major impact on your future systems plans.

Don't ask the name of this company, because no one knows. Yet it is out there. Software is still a business that attracts such entrepreneurs.

People who say the computer industry has matured are talking about hardware. The software industry is a wide-open field, where anyone with a good idea, technical skills and access to a computer can still strike it rich. "It's a wild and crazy market right now," says David Lampe, assistant director of corporate programs at the Massachusetts Institute of Technology in Cambridge, Mass.

Lampe has some experience following Massachusetts' link to technology-based businesses. He authored *Massachusetts Miracle: High Technology and Economic Revitalization* (Cambridge, Mass: MIT Press, 1988), and now has a second book coming out that reexamines the state's high-tech industries.

"[Massachusetts] has been an area of innovation almost since it was founded," says Lampe. In fact, the New World's first foundry was built near Boston. Early colonists established shipyards and began exporting finished products to Europe. In the mid-1800s, Massachusetts was the nation's industrial center. Fittingly, the state's largest computer company—Digital Equipment Corp.—is headquartered in a pre-Civil War textile mill in Maynard, Mass.

And, despite Massachusetts Governor Michael S. Dukakis' admission last year that the Massachusetts Miracle is over, the Bay State may be the best place in the world for a start-up software company to seek its fortune.

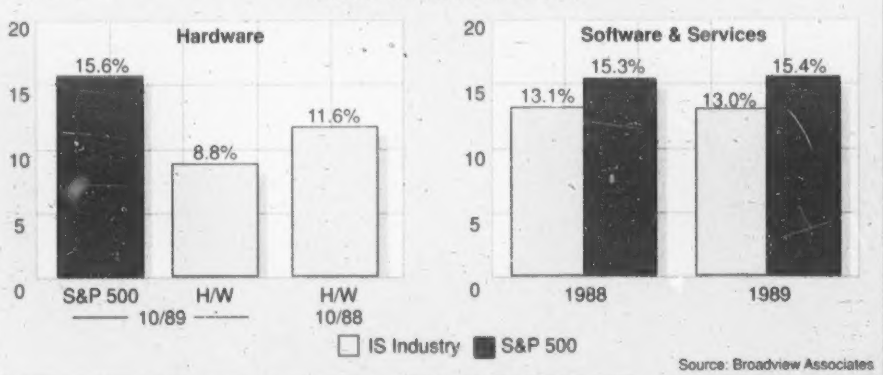
Plenty are trying. The Massachusetts Computer Software Council's directory lists 800 software companies. Although the council's list isn't a complete one—some unknown number of software companies are not included—it's the most comprehensive directory available. The council's statistics reveal an industry that is about as mature as the California gold-mining business was in 1849. Consider that nearly 70% of the software companies in Massachusetts were launched since 1980 and about 20% since 1985.

Hardware's Loss, Software's Gain

Certainly, Massachusetts has been home to some software industry giants, including Cullinet Software Inc., Lotus Development Corp. and McCormack & Dodge Corp. But the backbone of the state's software industry is formed by a preponderance of small companies. Some 44% employ 10 people or fewer; 68% employ 25 people or less. In all, 86% are privately held. Of the 800 companies in the council's directory, 70% provide revenue figures. A full 41% report annual sales under $1 million, and another 33% indicate annual sales between $1

How Software Stacks Up

Although slightly below average, software and services companies beat hardware companies when compared against the Standard & Poor's 500 index.



Source: Broadview Associates

million and $5 million.

Still, taken together, Massachusetts software firms are formidable, providing nearly 46,000 jobs in Massachusetts and roughly 300,000 jobs worldwide. More than a handful are growing at rates of 25%, 50% and even 100% each year.

Applications run the gamut, from computer games to large-scale databases. There are some noticeable patterns in the mix, however. About 42% are aimed at horizontal markets and 41.5% at vertical markets. Another 14% sell software development tools and systems. Thirteen companies listed in the council's directory specialize in artificial intelligence.

It's not entirely coincidental that Massachusetts software companies are experiencing a boom while the state's hardware manufacturers are closing plants and laying off workers. The turmoil in the state's minicomputer industry provides incentive for talented technicians who might have been considering an entrepreneurial move anyway.

According to Paul Deninger, who follows the Massachusetts software industry for the investment bank Broadview Associates, it's not the first time a decline in one high-tech industry has fueled progress in an emerging technology.

The state's minicomputer manufacturers got a boost from the decline in space-related business in the 1960s, points out Deninger, a principal of the Ft. Lee, N.J., firm, which specializes in mergers and acquisitions in the IT industry. "Now we're going to see a huge spin-off into software. [Massachusetts hardware companies] are definitely in decline," he says. "I believe we've already begun to see new trees sprouting from fallen trees."

The attraction of software is simple enough, says Deninger. First of all, it costs next to nothing to launch a software start-up. "These are not products that come out of a research and development program where millions are spent. It's a couple of people with great ideas and great skills. The need for capital comes later, when it's time to go to market."

That makes a software company not only easier to start than a hardware company but easier to sustain. A small software company can plug along for years on a slow growth path and still make money. "But an entrepreneur in the hardware business has got to hit a home run to have a financial success," Deninger says.

Software also offers a better return on investment than hardware, according to

Seven Software Successes

Here's a sampling of Massachusetts software houses experiencing meteoric growth.

COMPANY	LOCATION	FOUNDED	OWNERSHIP	MASSACUSETTS CONNECTIONS
AICorp Inc.	Waltham	1975	Stock offering filed with the Securities and Exchange Commission in May.	President and CEO Robert Goldman is former head of Cullinet Software.
Business Software Technology	Westborough	1984	Now a division of publicly traded Legent Corp. of Vienna, Va.	The five founders are former Cullinet Software employees.
Index Technology Corp.	Cambridge	1983	Publicly traded	Founders were part of a group from MIT that started the Index Group consulting firm in 1969.
Interactive Images Inc.	Woburn	1981	Privately held	President and CEO R. Douglas Kahn was previously a vice president at McCormack & Dodge. Other officers came from Cullinet and Digital.
Marcam Corp.	Newton	1980	Privately held	Cofounder Paul Margolis, Harvard Business School graduate; early career at a Waltham, electronics firm, Keltron Corp.
Progress Software Corp.	Bedford	1981	Private	Three founders are MIT graduates. They left MITROL, a Woburn software house with connections to MIT, to form Progress.
Software 2000 Inc.	Hyannis	1981	Privately held	Founder Robert Pemberton held management positions at State Street Bank and Trust in Boston and Boston Safe Deposit and Trust. Other officers attended Babson College, Boston University, Harvard and Northeastern University.

studies conducted by Broadview Associates. The firm's figures show a median return on equity for hardware manufacturers at 8.8%, versus a 13% return for software and services. "The numbers say that software is the place to be," Deninger adds.

The hot new companies experiencing such gigando growth have bet their futures on trends that have emerged only in the past decade, says Deninger. The software firms specializing in traditional, centralized mainframe applications aren't finding the same success, he adds.

For instance, Hyannis, Mass.-based Software 2000 Inc. tied its product line to the IBM midrange market, first providing software for the S/3X machines and now the AS/400. The software isn't particularly exotic, basic accounting and human resource packages, but chief executive officer and chairman of the board Robert Pemberton saw uncharted territory when IBM announced plans to enter the midrange.

Finding an underserved niche is the primary path to success for start-up software houses, says Lampe. At Software 2000, it's paid off in a big way. The company has a compound annual growth rate of 100% over the past six years. The company went from zero earnings as a start-up in 1981 to $22 million last year.

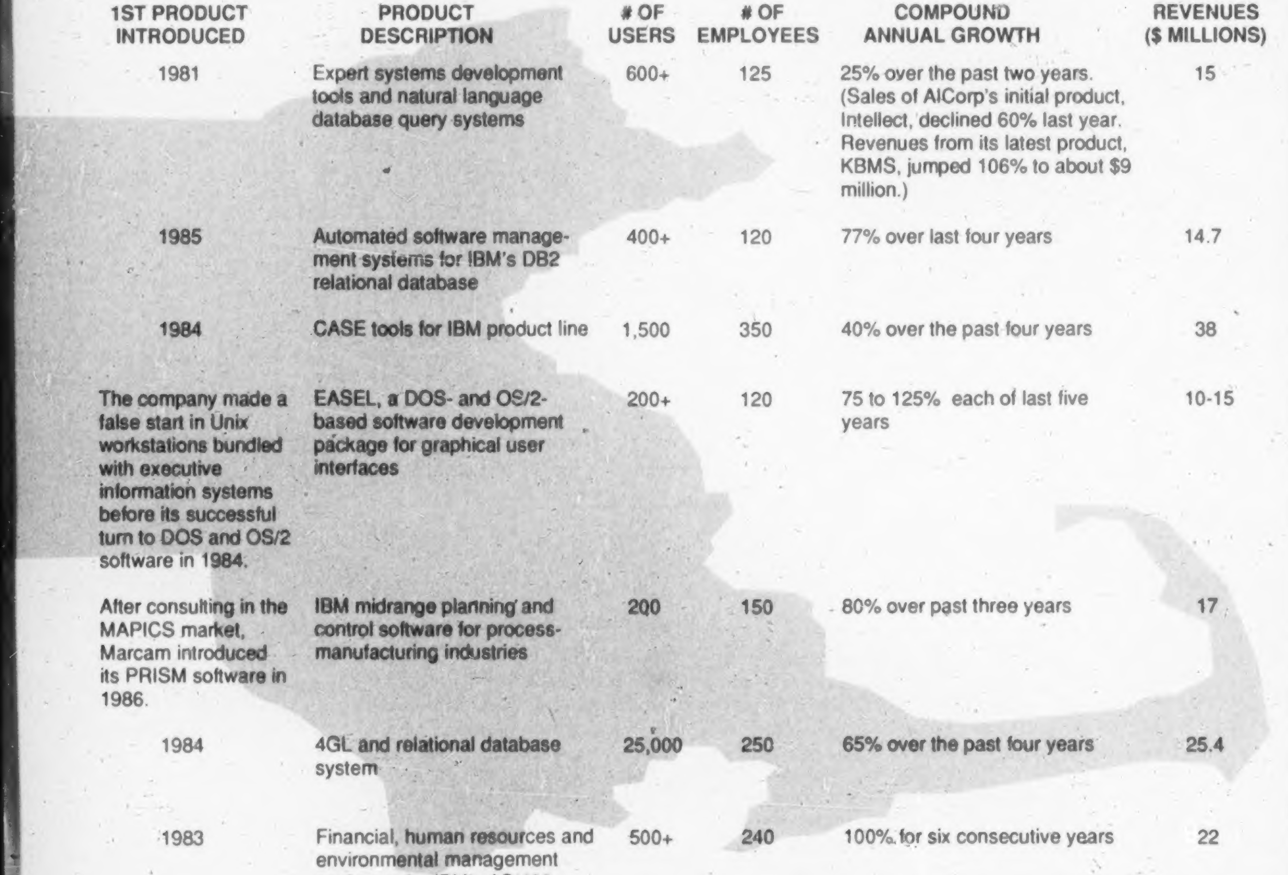
Pilgrims' Progress

Still, at least one of Massachusetts' small powerhouses is bucking the trend. Progress Software Corp. of Bedford, Mass., unlike its brethren in uncrowded niches, is out of the trenches and up against Oracle Corp. and other giants in the relational database market.

Chad Carpenter, vice president of sales and services, attributes the small firm's success against the Goliaths partly to Progress' reliance on direct sales and specialized resellers. Initially, Progress executives spent a lot of time trying to line up the support of big hardware companies. Now, they think that strategy would have left them lost in a crowd of competing relational database management system vendors.

The phenomenal growth of Progress and a number of its Massachusetts neighbors is no accident, says Pemberton. The Bay State has been tied to software development since the days when programmers adjusted analog switches. The legacy is an infrastructure that may be unmatched anywhere in the world.

"When I look for new services or suppliers, I don't have to explain that soft-



1ST PRODUCT INTRODUCED	PRODUCT DESCRIPTION	# OF USERS	# OF EMPLOYEES	COMPOUND ANNUAL GROWTH	REVENUES ($ MILLIONS)
1981	Expert systems development tools and natural language database query systems	600+	125	25% over the past two years. (Sales of AICorp's initial product, Intellect, declined 60% last year. Revenues from its latest product, KBMS, jumped 106% to about $9 million.)	15
1985	Automated software management systems for IBM's DB2 relational database	400+	120	77% over last four years	14.7
1984	CASE tools for IBM product line	1,500	350	40% over the past four years	38
The company made a false start in Unix workstations bundled with executive information systems before its successful turn to DOS and OS/2 software in 1984.	EASEL, a DOS- and OS/2-based software development package for graphical user interfaces	200+	120	75 to 125% each of last five years	10-15
After consulting in the MAPICS market, Marcam introduced its PRISM software in 1986.	IBM midrange planning and control software for process-manufacturing industries	200	150	80% over past three years	17
1984	4GL and relational database system	25,000	250	65% over the past four years	25.4
1983	Financial, human resources and environmental management packages for IBM's AS/400	500+	240	100% for six consecutive years	22

ware is not lingerie. My printer also does Lotus, and my furniture dealer supplies McCormack & Dodge," Pemberton says. Some Boston law firms specialize in the legal needs of software houses. And although venture capitalists will go to Borneo if there's a potential for profit, it can't hurt that there are a number of venture capital firms specializing in computer firms headquartered in Massachusetts. Such an infrastructure makes his business more efficient, Pemberton adds.

A Place for the Best and Brightest

The state's small software companies also get a boost from the industry's frequent mergers and acquisitions. "It's very easy for an acquisition to force some of the best and brightest to look for other turf," says Richard Carpenter, chairman and CEO of Index Technology Corp., a Cambridge firm that started in 1983 and now claims the largest user base of any computer-aided software engineering (CASE) tool vendor.

When Garden City, N.Y.-based Computer Associates International Inc. purchased Westwood, Mass.-based Cullinet, for example, it unleashed a lot of software talent on the job market. Cullinet employees—some anticipating a forced relocation, some fearing a loss of entrepreneurial spirit, and some who were encouraged to leave—began to look for new companies.

☐ PEOPLE WHO SAY THE COMPUTER INDUSTRY HAS MATURED ARE TALKING ABOUT HARDWARE.

Business Software Technology of Westborough, Mass., was a natural place for some of the Cullinet refugees to land. The company was founded in 1984 by Steven Velloff and four other former Cullinet employees to serve as troubleshooting consultants for Cullinet's customer base.

BST's first success was an accounting package developed for Boston-based John Hancock Mutual Life Insurance Co. through an arrangement to trade consulting services for computer time. BST sold the package to Cullinet and made money.

The company didn't take off until it turned to IBM's DB2 market. In 1987, BST introduced its first systems management and control software for IBM's relational database. The move proved to be a good one. The lack of competitors offering CASE tools for DB2 meant BST had a lot of running room. The company, now the BST Division of Legent Corp. following a recent merger, has grown at a compound annual rate of 77% to $15 million.

Of course, most of Massachusetts' small software companies won't experience such phenomenal growth. Many will fail. Still, software continues to be a more attractive lure for talent than the huge hardware houses. "Hardware has had its day," says Lampe.

Most businesses have already made huge investments in computer hardware; now they are looking for applications that take advantage of the installed base. It looks like there will be software companies enough to meet those needs. "Most projections," says Lampe, "are that it will continue to grow." ▭

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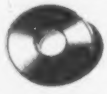

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How Europe Is Using CASE

European companies are more cautious than their U.S. counterparts about investing in new CASE technologies. But users in search of improved quality and lower costs are making Europe the world's second largest CASE tool market.

BY JAY PRAKASH

In Western Europe, as in the U.S. and Japan, computer-aided software engineering (CASE) is beginning to be recognized as a key to improving software quality and productivity.

Since 1986, Strategic Focus of Milpitas, Calif., has conducted numerous studies on CASE markets in Europe, Japan and the United States. By examining survey results, particularly between the United States and European countries, Strategic Focus has uncovered some interesting trends in the use of CASE tools.

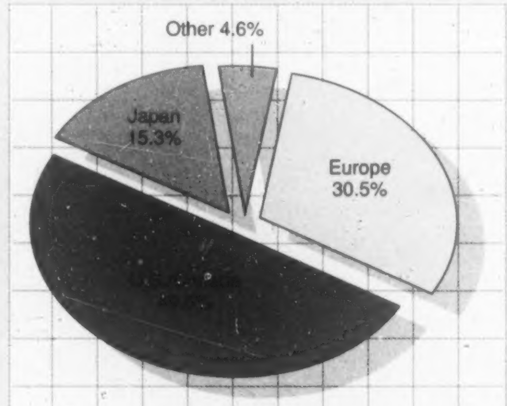
For the purposes of this article, CASE technology is defined to include planning, analysis, design, prototyping, code generation and reverse-engineering tools. Project management tools that are integrated with other CASE tools are also included. In Europe, as elsewhere, CASE tools have been developed for two broad categories of software: IS applications—standard financial, inventory control or order-entry packages—and engineering/embedded applications—as avionics, computer-aided design and manufacturing (CAD/CAM), and microprocessor software.

The worldwide market for CASE tools suited for IS applications development was $550 million in 1989—five times as large as the market for CASE tools used for engineering/embedded software development. Europe is the second largest geographic market for IS-type CASE tools, with a 30.5% share; Canada and the United States together are first with about 50%; and Japan is third with 15.3%.

CASE by Continents

Europe currently holds a healthy 30.5% share of the worldwide market for CASE tools used for IS applications.

1989 MARKET: $550 MILLION



Source: Strategic Focus

Reasons for using CASE technology and products are consistent throughout Europe and the United States. The top three reasons cited in our recent surveys are improving software quality, reducing man-months per project and reducing maintenance costs.

One reason CASE tools are not used more extensively in Europe may be prototyping. European users place more importance on prototyping than do their U.S. counterparts, and they are not at all pleased with the quality of current software prototyping tools. In fact, a majority of European IS, engineering and system software developers cite prototyping as the area that needs the biggest improvement in CASE tools.

Software developers who don't currently use CASE tools most often say they don't understand CASE technology or the capabilities of the tools. Other reasons they give include "lack of management commitment" and "value of CASE being uncertain."

In general, European companies are more cautious than their U.S. counterparts about investing in emerging technologies like CASE. Budgets in Europe for hardware and for software development tools are generally smaller than those in the United States, although such budgets in large organizations having revenues of $1 billion or more, may be comparable to U.S. corporations. IS staff in these organizations also share a level of sophistication in their understanding and implementation of software-engineering technologies similar to their counterparts in the States.

Although the percentage of CASE tool use is still small in both Europe and the United States, it should increase in both continents. A recent study done by Strategic Focus on the U.S. CASE market found an average of 23.3% of all IS software is being developed at CASE tool user sites with design tools. This corresponds to several case studies in which European users say one in four IS software projects are being developed using CASE tools. The U.S. figure is expected to double in two years.

The dominant industries in Europe using CASE tools to develop IS applications are similar to those in the United States: manufacturing and financial services. In the States, use of CASE tools within manufacturing is distributed between process industries, software houses, computer, communications and aerospace companies. In Europe, the computer and communications sector is the dominant manufacturing segment using CASE tools. Within these sectors, the number of companies with more than 200 software developers is fewer in Europe than in the United States. However, Europe probably has a greater number of small companies with less than 10 software developers.

CASE Computing Environments

At most end user sites in Europe, computing environments are still based more on host/terminal architectures than on distributed computing schemes. CASE tool vendors such as Softlab of Munich and CGI Informatique of Paris derive over 90% of their revenue from mainframe-based environments.

For IS applications development, IBM is the dominant mainframe platform in Europe, followed by Digital Equipment Corp. In minicomputers, however, Digital systems are more frequently used than IBM's, followed by Hewlett-Packard Co. and Groupe Bull SA. This situation is similar to that in the United States except that Digital's presence in Europe is nearly 10 times stronger than it is in the States. In our study, 22% of survey respondents in Europe indicated they are using Digital as the primary mainframe software development platform, compared with 2.8% in the States.

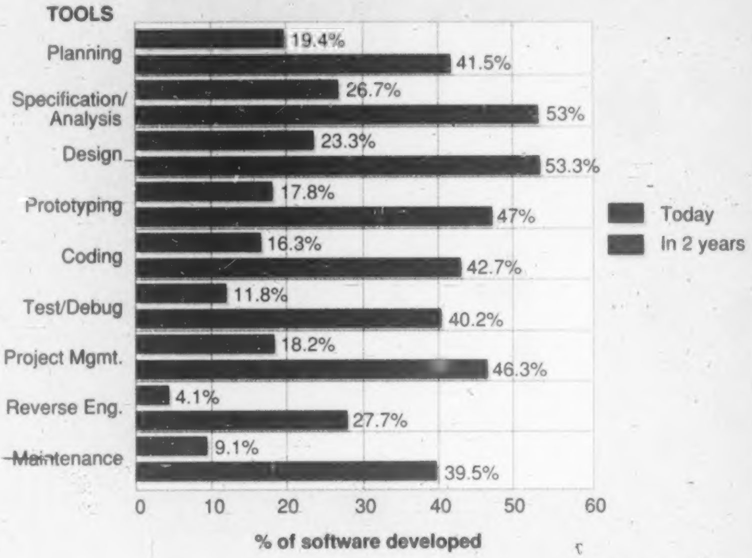
☐ EUROPEAN USERS ARE CAUTIOUS ABOUT INVESTING IN CASE TOOLS.

The mainframe-centered software development environment in Europe is quickly changing, however, with workstation vendors such as Sun Microsystems Inc., Digital and others reporting record European sales. Digital workstations are used by a greater number of IS software developers than Sun's; this situation is reversed in the United States. Also, HP workstations are used by more software developers in Europe than in the States.

For engineering applications, Digital mainframes and minicomputers, as well as Sun and Digital workstations, are used by more European software developers than are any other platforms.

A Look at the U.S. Market

U.S. software developers use CASE design tools as often as their European counterparts, although Europeans make greater use of project management tools.



Source: Strategic Focus

Microcomputers from Apple Computer Inc. are more popular as software development platforms in Europe, at 12% of survey responses, than they are in the United States, where only 1.4% of developers use them for this purpose. As in the States, the PC-based software development market is dominated by IBM (60%), Compaq Computer Corp. (25%) and other makers of IBM PC compatibles (52%).

In terms of software development environments, the Integrated Project Support Environment (IPSE), is still in its infancy in both Europe and the United States. A perception exists in many U.S. organizations, however, that the Europeans are ahead. Certainly, some large organizations in Europe, such as British Telecom and Thomson CSF in France, have invested heavily in implementing these environments. Numerous technical hurdles remain before a true low-cost IPSE can be implemented, and most companies have neither the resources nor the understanding to implement a customized IPSE.

As with other emerging technologies, several initiatives are under way toward establishing CASE standards. One such major initiative in Europe is to make a standard of the Portable Common Tool Environment (PCTE), which is one of the end products of the European Community's European Strategic Program for Research in Information Technologies (ESPRIT). PCTE is an interface that makes any CASE tool set platform independent. Although some degree of support from the major computer vendors such as Digital, Hewlett-Packard and IBM is emerging, most of the independent CASE-tool vendors are hesitating, and few implementations of this environment exist. As Thor Johnson, director of marketing at Cadre Technologies Inc. in Providence, R.I., observes: "We have a healthy respect for PCTE+, [the latest version of PCTE]; however, we have to wait for implementation at the operating-system level by the computer vendors before we can support it."

Structured Methods

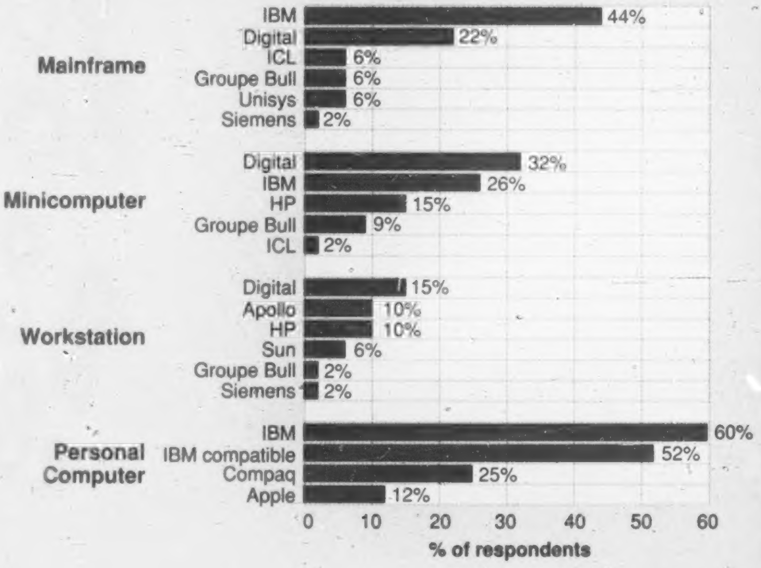
Among the structured methods that are used to form the foundation for front-end CASE tools, Yourdon-DeMarco is a strong favorite with both U.S. and European software developers. The James Martin approach (supported in CASE tools from Texas Instruments Inc. of Dallas and KnowledgeWare Inc. of Atlanta) and the Jackson method, (which originated in Britain), are tied for second place in Europe, but are not among the top three methods of choice in the United States. After Yourdon-DeMarco, U.S. developers favor various in-house methods and Gane & Sarson. Complicating matters somewhat is the fact that each European country has its own popular method. For example, Structured System Analysis and Design Method (SSADM), which was developed by CASE vendor Learmonth Burchett Management Systems (LBMS) of London, is mandated on all U.K. government software projects, and Merise is commonly used by many IS software developers in France.

Object-oriented design (OOD), an approach that represents a fundamental break with the traditional function- or data-oriented approaches, appears to have a greater level of acceptance among software developers in Europe than in the States. This acceptance was evident in the European Fighter Aircraft Program's recent major contract award to British-based IPSYS Software PLC to supply the IPSYS tool set, which is based on the Hierarchical Object Oriented Design (HOOD) method. Originally specified and developed by the European Space Agency, HOOD now will be used by all the fighter consortium partners (British Aerospace, U.K.; MBB, West Germany; CASA, Spain; and Aeritalia, Italy) and their subcontractors to design computer software for the aircraft and the subsystems. "We are seeing increased usage of OOD techniques on Sun platforms and greater sales of C++ through our Catalyst program in Europe relative to the U.S.," observes Steve Martino, manager of CASE market development at Sun.

☐ IT'S IMPOSSIBLE TO CHARACTERIZE A TYPICAL EUROPEAN CASE USER.

Europe's CASE Platforms of Choice

IBM comes out in the lead as the choice for both mainframe and PC software development platforms. Digital holds a stronger position here than in the U.S., however.



Source: Strategic Focus

Use of C and C++ should continue to increase among users on both continents. Also on both continents, increases should be seen in the use of fourth-generation languages and in the Ada programming language, for engineering applications. The level of COBOL use should stay the same in Europe, but should decline in the States over the next two years.

Myriad CASE Cultures

It's impossible to characterize a typical European CASE user. Many differences prevail between European countries in language, corporate culture, budgets, role of government and training of software developers.

The Scandinavian countries are far more advanced in using software engineering principles and CASE tools than are other European countries. "Companies in these countries are much more receptive to the usage of structured methods, as well as consulting, to aid in the transfer of CASE technology into their organization, relative to their peers in the U.S.," says Larry Howard, director of worldwide sales and marketing for Texas Instruments' CASE products. However, due to the smaller economies, the potential market for CASE tools in the Scandinavian countries is inherently not as large as it is in Britain, France, Italy or West Germany.

France has the potential to become a substantial market for CASE tool use, thanks in large part to the high level of education and training of its software developers. Structured analysis and design methods such as Merise are used routinely to develop software in IS shops where CASE tools have not been installed. Cheryl Gerelle, head of Digital's CASE marketing in Europe, agrees. "In a survey done by Digital some time ago, we found that the French were ahead in the usage of structured methods compared to many other countries in Europe," she says.

Another factor in France's favor is that it has the largest share of the estimated $40 billion European software market. However, a major disadvantage to non-French CASE-tool vendors selling in this country is the need for a French-language interface to CASE tools and French-language training manuals. So far, the language barrier has prevented many U.S. vendors from making further inroads into this market.

The West German software market is the second largest in Europe, followed by Britain and Italy. German companies have been more conservative in adopting new software-engineering technologies, compared with other European countries and the United States. "However, more recently, since the AD/Cycle announcements from IBM, the Germans are beginning to sit up and take notice," says Philip Caltabiano, vice president of international sales for KnowledgeWare.

☐ WEST GERMAN FIRMS HAVE BEEN CONSERVATIVE IN ADOPTING CASE.

Gerhard Held, senior director of CASE products at Siemens AG in Munich, agrees. "AD/Cycle has generated a lot of interest in CASE here. It is almost a revolution. There have been numerous seminars and articles in the press on the subject. This has helped generate a lot of CASE tool sales for Siemens in Germany." ▭

Jay Prakash is a founder and principal consultant of Strategic Focus, a consulting and market research firm based in Milpitas, Calif.

Business Is Good for Outside Services Vendors

Increased reliance by IS departments on outside resources means swelling revenues for computer services vendors.

BY MADELINE FRANCHI

Use of outside services may contract during weak economic times, but that doesn't seem to be happening to information systems (IS). DATAMATION's surveys of IS budgets show that IS executives are buying more outside services this year and last than they thought they would.

In the 1988/1989 Budget Study, IS execs estimated that an average of 9% of their budgets would be spent for outside services in 1988, with 9% earmarked for such help in 1989. However, respondents to this year's (1989/1990) Budget Study report that outside services actually grabbed a 12.3% chunk of their IS budgets in 1989, and they anticipate a 12.6% allocation for applications development, systems integration, facilities management and other outside resources in 1990.

This increased reliance is good news for those of you in computer and data-processing services. Revenue growth in your industry is surging.

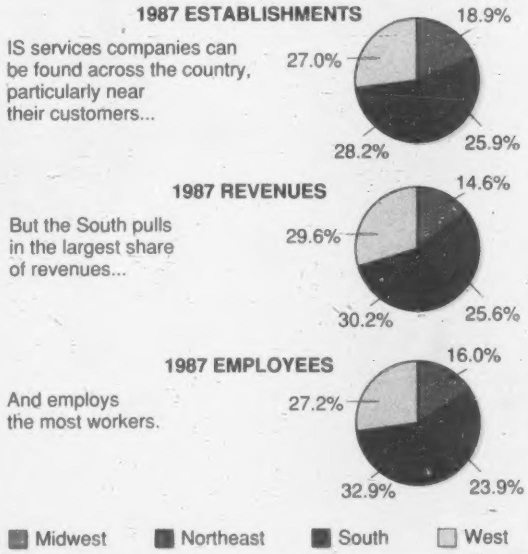
Preliminary figures recently released from the U.S. Commerce Department's Census of Services Industries, conducted every five years, indicate that revenues from establishments primarily engaged in computer programming and software services represented 12.5% of the total business services receipts in 1987. Revenues from programming and software services (which include prepackaged software and integrated systems design) swelled from $8.26 billion in the last census (which reported 1982 data) to over $27.15 billion this time around, a compound annual growth rate of almost 27%. The industry surged from 9,925 establishments nationwide employing 127,122 workers in 1982, to 21,594 establishments with 306,211 employees in 1987.

By region, the Northeast, South and West each account for between 25% and 33% of establishments, revenues and employment. The South predominates, but it covers a large area encompassing 16 states and the District of Columbia. Although it lags behind the other regions, the Midwest still is home to 19% of establishments, takes in 14.6% of the revenues and employs 16% of the industry, according to the most recent census.

But within each region, analysis by state reveals that most of the industry and jobs are actually concentrated on the two coasts, an indication perhaps that the service industries are set up near their customers. Ten states accounted for 71% of the receipts, 69% of employment and 63% of the number of establishments in 1987. Just the top three states combined—California, Massachusetts and Virginia—generated revenues of $10 billion in programming and software, 37% of the total. These three states are the top employers, too, with 35% of the work force—106,995 people. ▭

For more information on Cahners Economics' forecasting services, including seminars, newsletters and diskettes, contact Dan Buchan at (617)-558-4758 or (617)-964-3030, by fax at (617)-558-4402, or write Cahners Economics, 275 Washington Street, Newton, MA 02158.

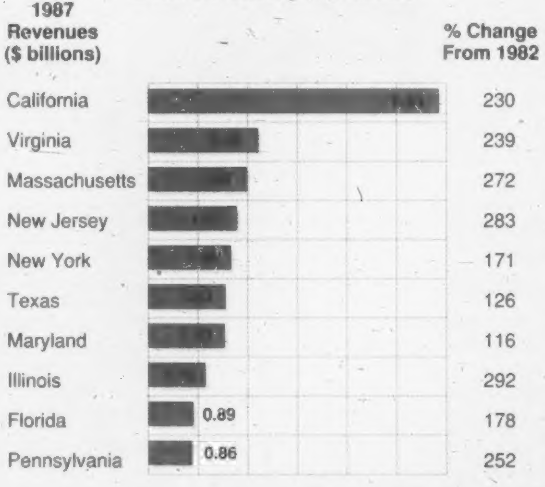
Services Are Booming All Over



Source: U.S. Commerce Department

The Top 10 States in Services

California leads the pack in services revenues, but Illinois, New Jersey and Pennsylvania are on the fastest growth tracks.



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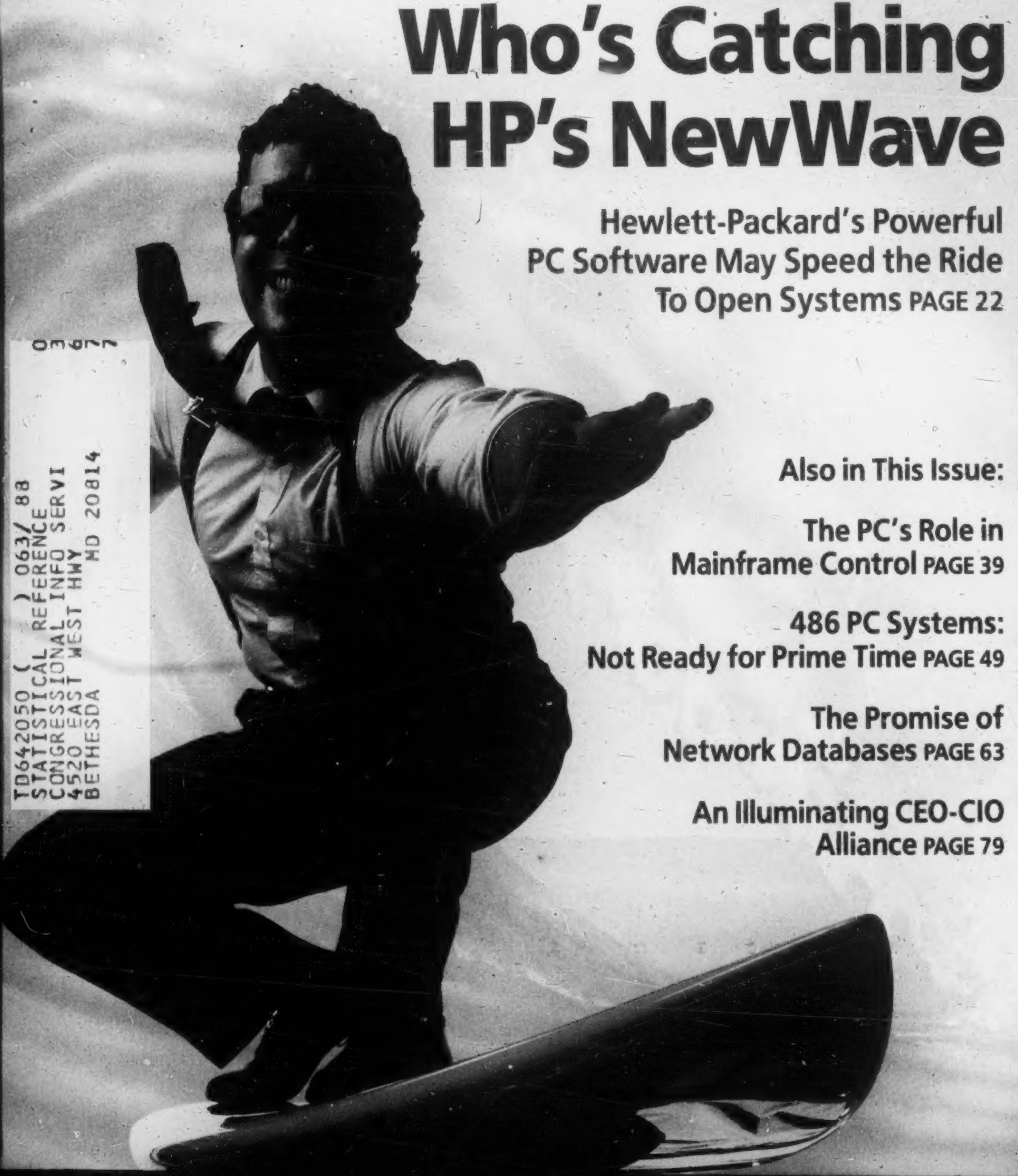

Who's Catching HP's NewWave

Hewlett-Packard's Powerful
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COVER STORY

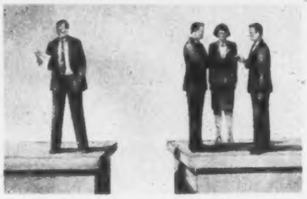
Surf's up for Hewlett-Packard's vision of an object-oriented software environment.

Who's Catching HP's NewWave 22

BY JOHN McMULLEN The newest NewWave ships this month. Just how big a splash it makes as an open systems environment depends largely on how well Hewlett-Packard's software strategy is embraced by former competitors.

Cover photography by David Bradley

SPECIAL REPORT



The Out of Touch CIO 30

BY RALPH CARLYLE The latest Coopers & Lybrand/DATAMATION survey of chief information officers reveals that CIOs are dangerously disconnected from the business side of the house, customers and the executive's own users.

INSIGHTS ON DISTRIBUTED COMPUTING

With the PC front end, we're freeing up our data center people to make the data center more efficient, and we're also able to keep our support cost down as we move toward supporting that second data center.

Howard Taylor
Manufacturers Hanover Trust Co.
PAGE 39

The demands of these new computing environments will require a broader vision by MIS managers than simply linking PCs to mainframes, and HP's model is one of the first indications of this.

William F. McSpadden
Plant-Wide Research Group
PAGE 45

I thought we needed better networking, but what I found was that the networking was good—almost too good. There was no control of the information.

Jeffrey Kent
Allen-Bradley Co.
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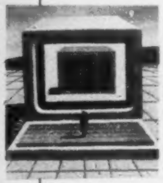

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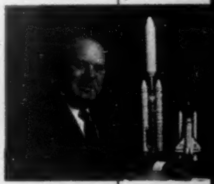
BY RALPH CARLYLE When is decentralization a bad idea? When you're spending as much on IS each year as your net earnings and your IS staff is duplicating work.



For Martin Marietta's Wiltshire, separate is out and integrations is in.

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The Agony of Atlantic's Users 94

BY TONY COLLINS The collapse of Atlantic Computers, has left users painfully aware that it is they who will pay.

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The Rising Tide of Openness

When John Young, the president of Hewlett-Packard Co., gave the keynote address to UniForum earlier this year, his message was simple and practical. He told the UNIX conference that the benefits of open systems—as embodied in UNIX and other software that could run on different types of computer equipment—were undeniable from both a strategic and economic point of view. But, he said, to assume that this open world was the only world was a serious mistake.

Photograph by David Bradley

McMULLEN rides the NewWave

Young said that open systems advocates and companies such as HP must build bridges to older, proprietary worlds. To think that user organizations would simply throw out existing systems and embrace open systems was absurd; investments are simply too great for that to happen. Young's message certainly makes a lot of sense for companies such as HP; you'd expect as much from established vendors that built businesses on proprietary computer designs.

And HP's recent actions with its NewWave graphical user interface put substance behind the words and show that the company is serious about building the bridges that president Young talked about. Originally developed jointly with Microsoft Corp., NewWave, which runs with the popular Microsoft Windows program, has won the support of AT&T, Data General Corp. and NCR Corp. These companies intend to use NewWave as a front-end desktop tool with their own office automation software offerings. At the same time, HP is attempting to recruit independent software suppliers to write applications programs that will use NewWave capabilities.

The potential benefit of all this activity to you, the IS professional, is summed up by our San Jose-based associate editor, John McMullen, in this issue's cover story. "Now that HP and its partners have further articulated their future NewWave plans, it's clear that NewWave is more than just a sexier version of Windows," he writes in "Who's Catching HP's NewWave," page 22. "Rather, it's a vision of an open systems world incorporating applications running across a wide universe of possible platforms."

If that's the case, and HP and others are able to really craft the open systems world they envision, the result will be a rising tide of choice and capability that will spread computing much further and wider than it reaches today. And perhaps that's the real message in Young's UniForum address.

Pity the Poor CIO

You've the read the stories in the general business press. The chief information officer is an endangered species, an executive in search of a function. The latest Coopers & Lybrand/DATAMATION survey of CIOs reveals what the problems are inside the executive suite. Our Special Report this issue, "The Out of Touch CIO," page 30, examines how disconnection from the business side of their companies, their customers and their own IS users is undermining the CIO's position. The message to all CIOs, or those that perform the function, is heed the warning signs: your IS future is at stake.

David R. Brousell, Editor

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SPECIAL REPORT

MANAGEMENT SURVEY

The Out of Touch CIO

The latest Coopers & Lybrand/DATAMATION survey of chief information officers reveals that CIOs are dangerously disconnected from the business side of the house, customers and the executive's own users.

BY RALPH CARLYLE

In recent years, a cottage industry has grown up around the notion of the chief information officer (CIO). The CIO was to be an executive who straddled the worlds of business and technology and aligned the two. The idea caught on in the 1980s and today nourishes not only the top IS officers who usually fill the role but also the consultants, executive search firms and media that give the CIO industry its life. A new survey of the nation's top IS officers, however, shows that the CIO movement could be unraveling at the seams.

"Our 1990 survey is a series of red warning flags that point to dangers ahead," says Ron Brzezinski, a partner at the accounting and consulting firm of Coopers & Lybrand, who directed the Coopers & Lybrand/DATAMATION CIO survey. "And the dangers are many."

The previous two surveys, in 1988 and 1989, both showed that IS executives were battling unsympathetic corporate cultures and losing. These battles are still being fought. But this year's new survey of top IS executives at over 400 of the nations' top 1,000 companies shows CIOs to be their own worst enemies. Their biggest battle is with themselves. Many are still clinging to a paternalistic view of information systems users, seeing them as something to be controlled and manipulated rather than served. Thus, few of them relish the thought of managing in a decentralized environment, since they yearn for something they can control and get their arms around, not for some amorphous organizational culture that makes control more difficult.

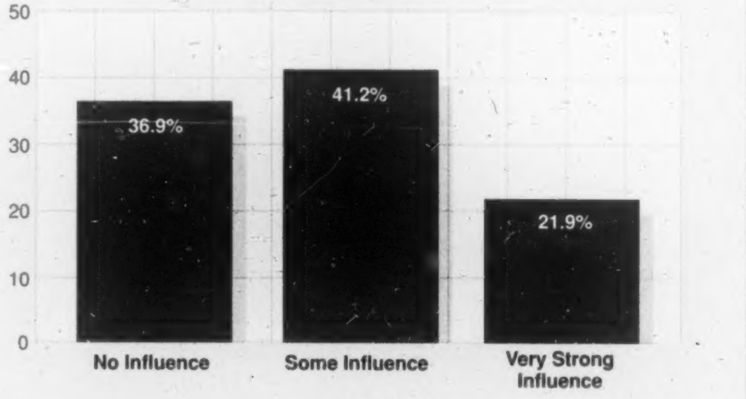
Illustration by Richard Elmer

This is why many IS executives interpret the CIO role as leader or IS czar. "They are reluctant to serve the corporation," says Brzezinski, once a CIO himself at the Quaker Oats Co.

Being a servant of the corporation means being available to end users and the company's customers. It is apparent from the way top IS officers manage their time that this isn't the case.

Over 62% of their time is spent just running the IS organization—23.3% of it solely behind a desk. "They are not getting out, not in touch," says Brzezinski, who adds, "you can't align the worlds of business and technology from behind a desk."

CIOs aren't just spending less time with their own end users than they should, they are largely ignoring their ultimate customers, the people and companies their firms actually sell to. Only 2.7% of



CIOs Are Not Influencing Corporate Strategy

Seventy-eight percent of survey repondents say that IS is either having no effect or only a slight effect on the development of their company's business strategy.

Source: Coopers & Lyband/DATAMATION 1990 CIO Survey

CIOs' time is spent with their companies' customers, thus making it difficult for them to handle the business issues associated with IS within their own companies. This seems to imply that CIOs are denying themselves direct experience with their ultimate customers, relying instead on indirect information from business managers within their own companies. A telling statistic is that CIOs spend far more time (4.4%) at industry conferences—many of which discuss what the role and the agenda of the CIO should be—than in front of their companies' customers.

When asked how they should allocate their work schedules, the CIOs said they wished to reduce their desk time to about 19% of the total and would spend more time (6.2%) with the company's customers and speaking at and attending conferences (5.7%). But both figures are lower than the 8.7% of their time (just over four weeks) they would like to spend on vacation and personal days, activities which currently consume 7.7% of the CIOs' time.

Not Enough Business Savvy

A lack of direct business experience is apparent in other statistics, as well. Only 20% or so of CIOs were promoted or transferred to the top computer executive job from business management positions within their companies. Almost 6% came from operations; 5% from finance, about 2% from planning, 1% from marketing/sales, close to 1% from administration and 5% from the Other category. The remaining 80% were either hired or promoted from IS positions, with 50% coming from other companies and 30% promoted from IS jobs within their own companies. Of the 80% hired from outside, 24% of the hires came from executive search firms.

CIOs don't seem to be highly in touch with the computer industry at large either, as a quiz on their general knowledge revealed. The CIOs were given the 20-question quiz at the Coopers & Lybrand CIO Forum held this spring in Miami. The average age of CIOs taking the quiz was 47 years. Nearly two-thirds of all of them earn $100,000 or more per year, with 6.5% earning more than $300,000. On average, they had been in the industry for 20 years. The most questions even answered was 15, and the best score was 9, a failing grade by school standards. Almost 20% of those answering didn't know that IBM's current flagship operating system is MVS. Forty percent didn't know the name of the head of the world's largest independent software vendor, Charles Wang of Computer Associates International Inc. Only 80% knew that Digital Equipment Corp.'s latest supermini is called the 9000 series. And none at all knew that the series number of IBM's first general purpose computer was the 701.

The quiz is hardly scientific, but it does suggest that CIOs may be losing touch with their technological roots as well as with the business side. This impression is further confirmed in the Coopers & Lybrand/DATAMATION 1990 CIO survey. To assess the impact of five areas on their jobs in the 1990s and their degree of preparedness to handle issues arising in those areas, respondents were given a scale of 1 (minimal) to 10 (significant). The five areas were business environment, IS organization, technology, applications and globalization. Under these five categories were listed a total of 29 issues. An average score of 7 or more was registered for only eight of the 29 issues. Scores of 7 and 8 mean the issue has above-average significance. Scores of 5 and 6 were the norm and indicated that the issues were of only average concern or had average impact.

In the turbulent 1990s, when the only rule seems to be everything is changing at all times, these scores not only show a lack of preparedness but a lack of urgency and intensity. "The CIOs seem to be comfortable without just cause," says Brzezinski.

Many of the CIOs were caught short by the PC when it emerged, and because they weren't ready for it they fought it, and lost. "Now as we move into the multimedia technology decade, there's a danger of the same thing happening again," warns the C&L partner. Integrating and applying multimedia technologies for business solutions was one of the 29 categories. CIOs rated it only 18th on the job impact scale with a 6.17. In terms of preparedness, it scored a tiny 5.23 and was only 23rd on the list.

You can't align the worlds of business and technology from behind a desk.

Perhaps the CIOs' response to the issue of outsourcing was the most amazing of all. This category scored a 4.28 on impact and a 4.82 on preparedness—26th and 25th, respectively. One leading IS executive was astonished at this score, and echoed the view of many IS leaders polled by telephone after the survey results were known. "Any IS executive who doesn't put outsourcing near the top of his or her list of concerns simply isn't living in the real world," says Harry Wallaesa, vice president of MIS at the Campbell Soup Co. of Camden, N.J. "You have to perform a make or buy evaluation on everything you produce within the IS organization. Anyone not concerned about outsourcing is not concerned about the cost of the service provided to clients."

Many of the CIOs were caught short by the PC when it emerged. They fought it, and lost.

How CIOs Rate the Issues

On a scale of 1 to 10, with 10 being the most significant, CIOs rate the impact of various issues on their jobs and their preparedness in dealing with these issues.

	Impact	Preparedness
Business Environment		
Increased management expectations	7.47	6.72
Embedded IS in products, services	6.49	5.90
Reshaping business processes	7.24	6.01
The IS role in changing company cultures	6.41	5.67
Sharing applications management & ownership with business units	6.34	6.35
Linking the business to suppliers and customers via IS	6.44	5.83
Peer/CIO politics	6.04	6.00
Establishing a strategic role for IS	7.18	6.54
IS credibility	7.64	6.92
IS Organization		
Retraining, acquiring & keeping IS staff skills	7.51	6.51
Redefining technology, data & applications strategies & architectures	7.44	6.40
IS career paths	6.04	5.57
Changing centralization/decentralization roles & responsibilities	6.01	6.11
CASE tools changing the development process	5.80	4.84
Outsourcing of services	4.28	4.82
Repositioning/restructuring the extended data center	4.96	5.35
Technology		
Integrating & applying multimedia technologies	6.17	5.23
Desktop complexity & support	6.71	5.91
Consolidation of technology vendors & alternatives	5.58	5.86
Major new technology products	6.11	5.87
Establishing & maintaining enterprise technology standards	6.43	6.06
Managing & supporting new generations of LANS	6.51	6.06
Applications		
Rebuilding the application infrastructure	7.27	6.21
Expert systems or AI as integral components of business systems	5.29	4.18
Managing the enterprise data repository	7.04	5.85
Managing the enterprise software repository	6.50	5.94
Globalization		
Worldwide systems development	3.52	3.28
Worldwide operations	3.52	3.39
1992 changes	4.20	4.03

Source: Coopers & Lybrand/DATAMATION 1990 CIO Survey

The most staggering thing about the general knowledge quiz and the survey is that these answers come from the nation's IS elite: 19% of those responding actually bear the title of CIO, up from 14% three years ago. A further 35% are at the vice presidential level, up from 32% in 1988. Most remarkable of all, however, is that almost 52% of these executives viewed themselves as trend-setting users of IS technology. Only 32% said they were "average" and less still, 16%, saw themselves as "followers." This answer seems to suggest that these IS executives feel they are prepared for the uncertain 1990s.

"They are answering emotionally," counters Brzezinski. "Nobody can bear the thought of being a follower or merely average, but statistically, many CIOs must fall into these categories."

Brzezinski says that this self-delusion is the single biggest danger CIOs face in the 1990s, but that it's not too late for them to turn things around. "It'll mean a personality change for many of them."

The first thing CIOs must do, Brzezinski says, is transfer their loyalty from their profession to the companies they work for. Many are reluctant to do so, he feels, because demand for computer-related skills has been so great that job hopping often nets IS specialists lucrative advances in terms of salary, benefits and promotion. Thus, IS workers tend to be more profession- than organization-oriented. Their interest is in using the organization to develop personal skills that will be more marketable in the churning computer-related job market.

The higher up the IS executive career ladder a person goes, the more noticeable the job hopping becomes. The CIO survey shows that directors of IS are more stable than VPs and CIOs. Just over 45% of the directors have had one other top job in their career. Over 31% of those carrying the VP IS title have had three or more top jobs in their careers. At the rarefied heights of the CIO almost 51% have had three or more top positions.

Over one third of the total survey population have been the top IS people in two companies other than their present employers.

In the finance sector, this job hopping is more noticeable—and more lucrative—than in other business segments. Recruiters say that CIOs typically earn $350,000 in the financial services sector, compared with a $125,000 average in the C&L survey population as a whole. It's not uncommon, they add, for financial industry CIOs to be paid $1 million+ salaries. Each time these top IS officers shift companies, they typically hike their salaries by around 25%, say experts.

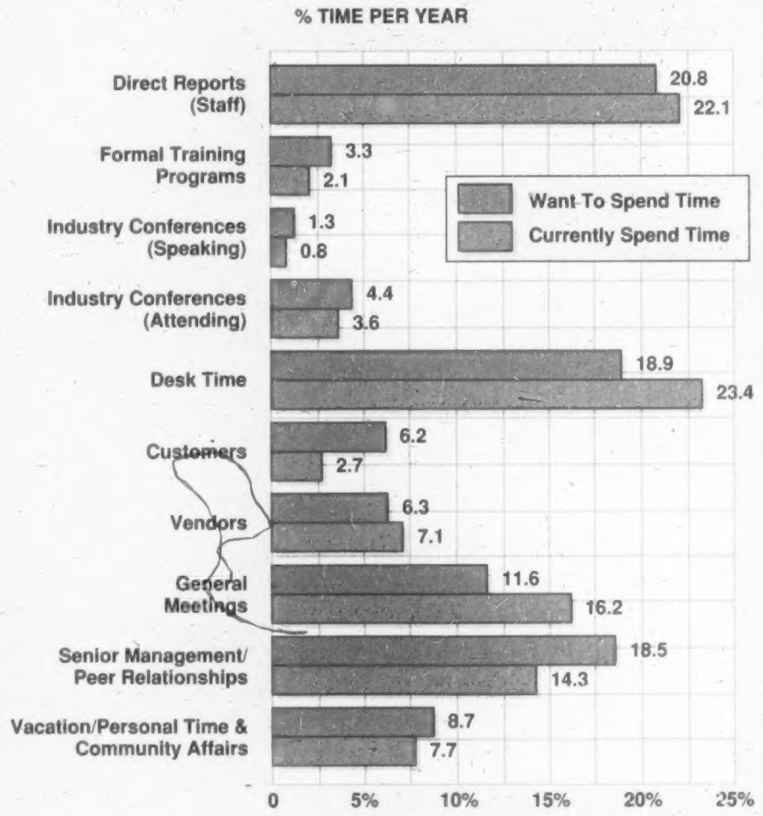
This high-stakes job hopping has not only hyperinflated CIO salaries and benefits, but has had two other consequences as well. One result shows up in a survey finding that CIOs identify human resource executives as their least supportive executives. This is confirmed by John J. Davis, head of New York City-based executive search firm John J. Davis & Associates. "One, it's turned the VP [of] Human Resources into an enemy of the CIO," says Davis, whose company makes its money placing IS executives in the $200,000-a-year and up range. The reason is that the well-ordered salary and benefits structure of the human resources department is thrown out of whack with every CIO job hop. The C&L survey shows that the vice president of human resources is far and away the least supportive of the CIO amongst all executive classes.

The second result of the CIO job hopping is that IS executives are replicating solutions at each company they go to. "It's human nature to reproduce what worked in the past," says Brzezinski, "but it's the wrong thing to do. CIOs must take a fresh look at today's problems." He believes the mean age of

Any IS exec who doesn't put outsourcing near the top of his or her list of concerns isn't living in the real world.

How CIOs Spend Their Time and How They Want To

Only 2.7% of a CIO's time per year is spent with company customers, while 39.6% of the time is devoted to general meetings and sitting at the desk.



Source: Coopers & Lybrand/DATAMATION 1990 CIO Survey

the survey population, 47 years, prevents many from doing this. "They've become set in their ways."

The sales and marketing side of the CIO's company, in particular, is likely to be most upset by regurgitated IS solutions, since these areas' requirements change constantly, and they are looking for innovative tools to help them keep ahead of customers. That's why the VP of sales/marketing was cited by CIOs as the second least supportive member of the executive suite.

Brzezinski believes that CIOs must transfer their loyalty from the IS profession to the company and become servants of the corporation. He believes that, if those two steps are taken, CIOs will begin to transform themselves from self-deluded outsiders to in-touch agents of change. But a further step is also required. CIOs must discover who their allies are. "It also helps to know who your friends are," he adds. "The CIOs identified that the CFO is their biggest supporter. And yet this is the executive that top IS executives least want to report to." Brzezinski notes that most CIOs (82%) feel they can have more impact in their companies by reporting to either the CEO or chief operating officer. He says, though, that the CIO should not to lose the CFO's support.

Business Managers' Power

But even if these steps are taken, and the reporting relationships work well, there is a school of thought that insists that it is already too late for CIOs, that, in essence, the whole movement is doomed. "It's not ego problems, or rigid personality, or even being out of touch that will sink the movement," says Positive Support's Janulaitis. "It's something else entirely." Janulaitis and others stress that the control of technology is being transferred away from the IS organization and into the hands of business managers. These managers have the business skills that out-of-touch CIOs lack. They also increasingly have control of the IS budget and can use outside companies to get the applications they need.

"IS executives that can't work with these business managers will become redundant," says Walter X. Kane, a 30-year IS veteran and vice president of IS for the Neponset Valley Health System Inc. of Norwood, Mass. "Even those that can may suffer a similar fate."

The C&L survey shows that the new business managers are already ascending in companies. The average annual IS budget at companies on the survey was close to $86.6 million. CIOs controlled $32 million of this directly and approved $18.5 million of indirect spending. That leaves $36.1 million, or almost 42% of the total, in the hands of the business managers. "And everywhere you look the percentage is growing," says Kane.

As technology becomes more of a commodity and further standards emerge, companies probably won't need a large IS organization, many experts believe. A small team of advanced technologists headed by a chief technology officer may be sufficient for companies to create the pipes and connections that will link their computer networks.

For CIOs, the choice seems to come down to two things: they can stay in a shrinking backwater operation—the data center, in essence—or seek new growth within their organizations as business managers. To go down the latter road, they must open up their personalities and connect. They must come out from behind their desks and from behind their notion of the CIO as a leader and DP czar.

"We've got to become the kind of person that gets a kick out of helping others succeed—the type that goes to a party and leaves his ego at the door," advises Bruce Brinick, vice president of IS at the Aviation Office of America Inc. in Dallas. "We've got to stop being the reluctant servant." ▭

486 PC Systems: Not Ready for Prime Time

Intel's new 80486 microprocessor packs a lot of power for numerically intensive applications. But until prices come down and 486-specific software becomes a reality, a cautious buying approach seems warranted.

BY EMILY LEINFUSS

As personal computers based on the 80486 microprocessor from Santa Clara-based Intel Corp. start to trickle out, IS decision makers seem pretty clear about where they think the 486-based machines will fit into their organizations now and over the next few years. Only a few of them are moving quickly to embrace the 486 in large numbers, at least for now.

Companies that are only after speed and power—particularly for computationally intensive applications—are buying 486s today, and their power gluttons are using the machines with glee. The reason to upgrade from a 386 to a 486 seems obvious if you look at the choice purely from a power perspective. According to Intel's own benchmarks based on integer and floating point measurements, performance of a 486 falls somewhere between 1.5 to twice times that of a 386 running at the same clock speed.

But many analysts contend that the speed of a 386 is more than adequate for most PC applications. They consider that the real leap forward in microprocessor technology occurred in 1986, with the long-awaited introduction of 386-based computers. At the time, the MS-DOS community leaped from the 16-bit architecture of 80286-based PCs to the much faster 32-bit architecture of the 80386. Those buying computers for more than raw computing power alone must ask some important questions before upgrading their 386 user base to 486 machines.

One essential question deals with price. At what point in the inevitable price erosion cycle will the 486 be worth the performance gains? Although the issue of price/performance is never easy to quantify, 486 machines are clearly priced at a premium over high-end 386 PCs. Lower cost, bare-bones 486 machines are starting to hit the market with price increases of $500 to $2,000 or

Illustration by Elwood Smith

more over their 386 counterparts. In time, the gap should narrow, as the price difference between 80286 and 80386SX machines has done.

But price is just part of the picture. Most potential 486 buyers are equally concerned about software. When will we see software that will truly exploit the 32-bit technology of both the 386 and the 486 chips? Will that software be more expensive and harder to implement for 486s than for 386s? After asking these practical questions, most companies wind up taking a conservative, wait-and-see attitude toward the 486 machines.

Today, four years after the 386 introduction, users are still waiting for a new generation of software that fully takes advantage of the 32-bit architectures of either the 386 or 486. Although some software is appearing in the form of MS-DOS extenders such as Microsoft Windows 3.0 that break the 640 kilobyte DOS memory barrier, most packages today do not take advantage of the newer chips beyond the obvious gain in speed.

Where the 486 Stands Out

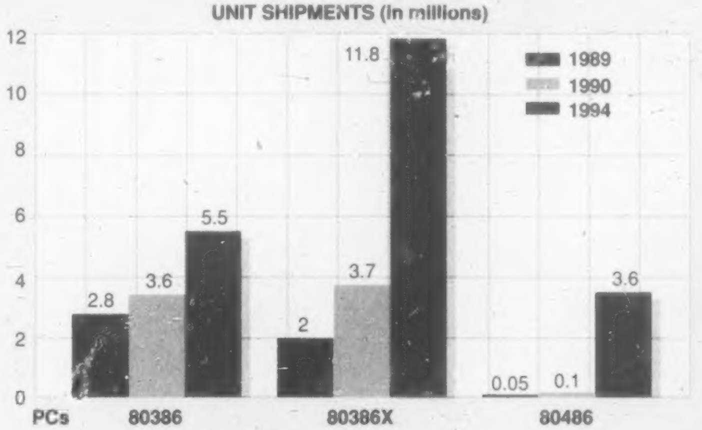
Even without 32-bit software, however, IS professionals have three clear reasons for choosing the 486 today. First, the 486 is fully upwardly compatible with the 386, so it will run any software that runs on the 386, including the MS-DOS, UNIX and OS/2 operating systems. Second, the 486 boasts a built-in, integrated, floating point numeric coprocessor. Achieving comparable performance on a 386 machine requires the addition of the 80387 coprocessor or an equivalent chip. Third, the 486 has a small internal memory cache system that improves performance. What all this adds up to is at least double the processing speed for the 486 over its 386 sibling.

☐ THE SPEED OF A 386 IS MORE THAN ADEQUATE FOR MOST PC APPLICATIONS.

According to manufacturers, most 486 machines sold to date have been adopted in two major areas: as network fileservers and as specialized, performance-sensitive applications such as software development and computer-aided design and engineering (CAD/CAE). For the most part, these are the same applications for which the 386 machines were initially targeted four years ago. The inevitable reduction in price, however, has driven the 386 into the mainstream of business computing.

Tomorrow's Chip du Jour

By 1994, worldwide shipments of PCs using the 80486 will begin to approach those based on the 80386. But for now, gaining market share is an upstream battle.



Source: Dataquest

One response to the need for a 486 is characterized by Terence Colligan, president of Rational Systems Inc., a Natick, Mass-based software developer. "The 486 was purely a speed purchase. It wasn't a lot more expensive than the 386 system we had, and it was almost twice as fast for the work we were doing."

Still, most manufacturers and users do not believe the 486 machines will become general purpose PCs for quite a while. In fact, they see the machines fitting into the very high end of the PC envelope and nosing their way into areas where dedicated engineering workstations and even minicomputers are the usual fare. For example, a fully configured 486-based system, optimized for CAD applications, costs between $10,000 and $15,000. That is minimal when compared with the cost of a traditional dedicated engineering workstation, says Pradeep Jatwani, marketing manager of Hewlett-Packard Co.'s North American PC division in Sunnyvale, Calif.

A Niche Market

Rick Eder, information technology coordinator at Rochester, N.Y.-based Eastman Kodak Co., believes that, right now, there is a place for each processor, and each processor has its place. He says the capabilities of the 486 chip, primarily its caching and integration with the floating point coprocessor, are suitable for numerically intensive engineering and research applications. The 486 will also find a niche in the emerging high-performance fileserver market, he says.

Eder does not believe the average desktop user needs 486 capabilities, at least not yet. For many business applications, the 386 chip is sufficient because it supplies the 32-bit architecture needed to run tomorrow's applications.

In its engineering area, Kodak has several 486 machines that are being used specifically for high-end CAD/CAE applications. The firm also evaluated the fileserver market where, says Eder, many of the offerings are 486-based. Price is also a factor with Eder when evaluating 486 machines. In the CAD arena, he says, the machines are starting to show up in an affordable range. "We are going for the right performance for the right price and for the right application at this point. That's the way we see it divided up."

Waiting It Out

Noxell Corp., a manufacturing firm in Hunt Valley, Md., is just beginning to evaluate 486 machines. John Kusik, Noxell's manager of systems planning, says most of his firm's machines are of the 386 and 286 persuasion. Kusik is cautious about 486 computers and is waiting for the bugs to be worked out. Some of the early 486s brought in were having problems with the small computer systems interface (SCSI) controllers, he says.

Kusik says that if Noxell's users demonstrate a real need for 486s, he may get them. But he doesn't see much of a need at this point. His power users, who mostly use spreadsheet applications, are getting

A Vote in Favor of the 486

One technology manager who sees a large need today for 80486 machines is Keith Fletcher, network administrator at Warner Lambert Co., a pharmaceuticals company based in Morris Plains, N.J. Fletcher is testing various 486 machines for speed, compatibility and price. Eventually he plans to use the machines as fileservers, but currently his firm is testing 486s on database-intensive applications and for some programming tasks.

Fletcher warns that the microprocessor alone is not the end-all when it comes to speed. He says he found that a 486, 25-megahertz machine is roughly as fast as a 386, 33MHz machine when running many applications. "You just aren't going to get a whole lot more speed out of the 486 chip when the clock speed is slower than the 386 chip," he contends. But the newer 33MHz 486 chip—currently available in limited supply—does considerably outperform the 386 running at the same clock speed.

Fletcher feels that the 486, with its built-in coprocessor and memory cache, represents the first generation of superchips that are on the way. Already, he is beginning to download mainframe database applications onto machines using the 486. "Once you have this level of power on your desk, you can easily work with large quantities of data, like the mainframe does," he says.

Although Fletcher is curious about new software that will eventually take advantage of the 386 and the 486 chips, he needs more power for his users right now. "We need maximum power with existing software, so we are looking for the fastest processor we can get. Eventually, we are going to have maximum power with the new software, and that will be even better."

by with 386 machines. Where Kusik sees the 486 eventually falling into place at Noxell is in certain graphically intensive applications and as network servers.

Another firm that is not jumping too quickly on the 486 bandwagon is New York City-based accounting and consulting giant Ernst & Young. According to Rick Richardson, the firm's director of technology, Ernst & Young is sticking with the 386, at least for now. Few Ernst & Young power users need 486 PCs immediately, says Richardson. And until prices come down and the 486 emerges as more of a commodity, migrating to the 486 is not going to be a big issue. Richardson also says his firm has few users doing CAD/CAM or compute-intensive kinds of applications where a 486 would be the way to go.

Bill Laurence, technology manager at the San Onofre Nuclear Power Station in San Onofre, Calif., says he, too, sees no ultra-compelling reason to migrate from the 386 to the 486. Although some of his CAD users have the new machines, he says the benefits in most cases don't seem to be significant. Laurence sees a streak of conservatism evident in IS purchasing these days. He claims many IS managers want other companies to wrestle first with new and tricky applications before they commit to the technology.

☐ THERE IS A PLACE FOR EACH PROCESSOR, AND EACH PROCESSOR HAS ITS PLACE.

He also feels the lack of software plays a role in the slow adoption of the 486. For example, he says if a 486 version of AutoCAD were marketed today (Sausalito, Calif.-based Autodesk Inc. does have a 386 version of its product) he would be buying a lot more 486 machines.

The Fileservers Are Coming

Despite vendor insistence that 486 machines are being used as network fileservers, most IS executives have yet to actually implement the machines in this way.

Barry Livingstone, chairman of the 486 Standardization Committee of the New York Micro Managers Association, has been testing a 486 as a network fileserver despite the lack of networking software. Livingstone calls the situation a catch-22. The manufacturers of networking software, he says, are starting to develop 486-specific features in their software, for which they will charge a premium. But, as of today, those features are just not available.

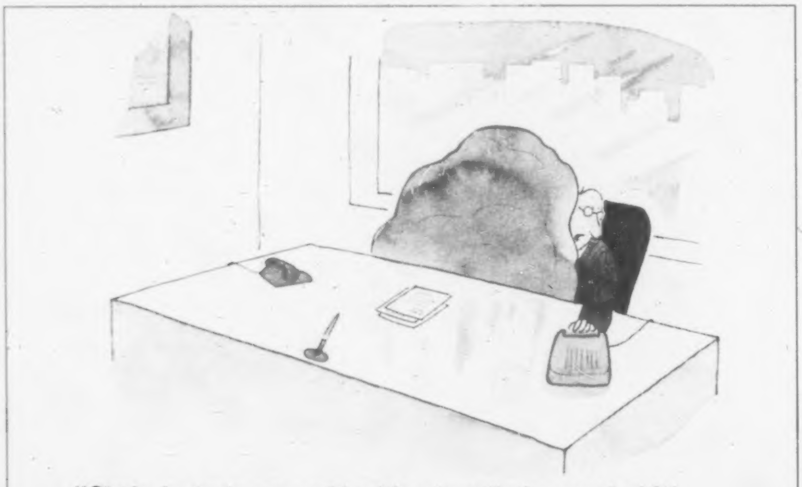
"One manufacturer of network software charges you more if the system is running on a 486. They have a [486 recognition] feature in their code, and unless that feature is enabled by the manufacturer, the code will not run. Yet you have to pay them the extra fee," he says. According to Livingston, some vendors charge extra for 486 software extensions that, as yet, deliver no added functions.

Livingstone says users want proof that the 486's performance increases will outweigh the increase in price over the 386. "The 486 [machine] is not going to look any faster to the user if it doesn't really take advantage of any 486 [microprocessor] features," he says.

Still, despite all the debates of the merits of the 486 versus 386 microprocessors—all of the balancing and measuring of price, performance, operating systems, applications software and networking environments—there is one issue that all IS professionals are very clear about. The day will come, probably in a less than five years and no more than 10, when 486 machines will be at the lower end of the PC market.

At that point, although IS decision makers will be upstream from where they are today, they'll still be caught in a similar tidal pool. The 486 will be the mainstream chip, and they will be trying to figure out where the 586, the *x*86 and beyond, will fit best into their computing environments. ▭

Emily Leinfuss is a freelance writer based in Sarasota, Fla.



"Gloria, just when was this airbag installed on my desk?"

Ringing Up New Business With PBXs

Tap into digital PBX's data channel and unlock a wealth of information in corporate databases. Astute IS groups are using those data to create a smart phone system that dramatically improves the efficiency of telephone-based workers.

BY LAMONT WOOD

If you think of your organization's private branch exchange (PBX) as "that thing the phone operator sits at," you may have to readjust your thinking. The latest in digital PBXs will allow information systems groups to provide telephone users with a wealth of caller-specific data before they even answer the phone.

That may be a far cry from the notion promoted by telecom suppliers in the early 1980s that PBXs would be *the* data transmission technology. But PBX is emerging as a powerful, if more limited, tool for IS.

"PBX lost the battle for data dominance—that issue is dead," says H. Paris Burstyn, vice president of telecommunications for Cahners Business Research Group in Newton, Mass. "Now it serves as a bridge, linking data and voice."

As digital PBX becomes the technology of choice for integrated voice/data applications, it will take its place in the web of connectivity tools. Beyond voice/data applications, PBX's switching capabilities will allow it to be used selectively as a gateway, such as from local area networks to host computers.

Payoff in Telemarketing

Today, 85% of PBXs are digital. That capability allows them to carry automatic number identification (ANI) and dialed number identification service (DNIS) signals within a company's phone system. When those two pieces of data—who's calling and who's being called—trigger customer database searches and customized call routing, phone-based sales and service groups can achieve double-digit increases in efficiency.

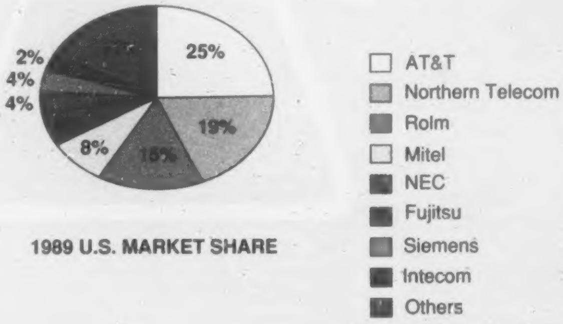
The most excitement revolves around ANI. ANI identifies the telephone number of the incoming call. Anonymous phone calls may become a thing of the past, a consequence that has aroused both opposition and support (see sidebar, "Will New Services Run Afoul of the Law?"). For businesses, the main attraction is that employees fielding the call know the caller's number. At minimum, that can provide a way to identify the customer by name and location. The telephone number can also be used to automatically retrieve database records—customer profiles, buying histories, service records, etc.—before the call is even answered.

ANI is increasingly available as part of T1 (i.e., 24-channel digital trunk) incoming 800-number services. Under Integrated Services Digital Network (ISDN) nomenclature, it's a PRI (primary rate interface) connection running "23-B plus D" (meaning there are 23 64-kilobit bearer channels and one data control channel). AT&T uses an out-of-band signaling scheme for ANI: the D channel carries ANI from the public network to the customer premises, where the PBX picks it up.

AT&T will be offering ANI in most of the country by the end of 1990, says Claire Diamond, an AT&T spokeswoman in Basking Ridge, N.J. Increasingly, local phone companies can be expected to offer single-line basic rate interface (BRI) ISDN connections incorporating two bearer channels and a control channel, which could also transmit ANI.

The Line on the PBX Market

AT&T, Northern Telecom and Rolm are the big players, but a host of other vendors are vying for PBX business.



Source: The Yankee Group

Will New Services Run Afoul of the Law?

The future of automatic number identification may be decided not by technical merit or market attractiveness. The most controversial telecommunications feature in memory, ANI has become a battleground in the right to privacy war.

A Pennsylvania state court, for example, recently enjoined Bell of Pennsylvania from implementing ANI as an analog residential service. Known as Caller ID and available only on local calls, the feature was accused of contravening an existing state wiretapping law, as well as violating the right to privacy.

There's a bill before Congress that would guarantee every citizen the right to strip ANI from his or her outgoing calls. There is already a 900-number service in California that will forward your call with ANI stripped out.

Yet caller identification has already made considerable headway. New Jersey Bell reportedly has already signed up 60,000 consumers for Caller ID service at $12 a month. Peripherals that will display Caller ID are for sale from private sources in—believe it or not—Moscow. Back in the USA, emergency 911 services have been using a version of Caller ID in various places, so that simply dialing 911 may lead to a visit from a patrolman, and people have blamed false alarms on their dogs. Whether ANI has picked up enough momentum to carry it past the opposition remains to be seen.

The DNIS service—identifying who's being called—has less obvious, but no less valuable, uses. Reservation and telemarketing agents often receive calls on multiple numbers for multiple advertising programs to a single phone set. With DNIS, the agent can know in advance which product is involved.

To take advantage of both ANI and DNIS, users of AT&T and US Sprint Communications Co. services must have ISDN. But MCI Communications Corp. now provides ANI and DNIS without an ISDN interface. It uses analog in-band signaling to carry these services over existing analog phone lines. In June, Northern Telecom Inc. became the first digital PBX manufacturer to support MCI's version of ANI with software enhancements (X11 release 16) to the Meridian 1 PBX that make it in-band capable.

Working Smarter

Creative use of ANI and DNIS to tap into customer records allows telephone sales and service groups to focus their efforts.

"With this combination of data processing and telecommunications, you have a telemarketing system on which you can simply turn up the volume," says Al Subbloie, vice president of Information Management Associates Inc., a software firm in Trumbull, Conn. "You can call more people, be smarter about who you call, establish a marketing database while on the phone and cross market later on. Customers [using ANI] report 40% improvements over previous manual telemarketing methods just selling to a repeat customer base."

□ ANI USERS REPORT SUBSTANTIAL SAVINGS OVER MANUAL TELEMARKETING.

Subbloie adds that the use of "predictive dialing" (which indicates if calls dialed by a computer are actually answered so that a person in the company can pick up the phone and talk to the party contacted) can increase productivity by 10 to 12%, since the manual misdialing rate is at least that high.

"You can analyze the demographics of your calls and buy lists of people who match those demographics so you can sell your products to them," says Dana Blankenhorn, editor of the "Teleputing Hotline," a telephone industry newsletter in Atlanta. "You may find that your best customers are 60-year-old gun owners, so you would seek lists of other 60-year-old gun owners."

"There are a lot of fascinating things you can do with it [ANI and DNIS]," says Dennis Fieldman, vice president of research and development at Communicator Asystance Systems Inc., a software firm in Chelsea, Mass. "You often call a firm for a specific reason, which the firm taking your call could anticipate.

"If you called an auto agency," continues Fieldman, "they could see from your number that you have a car undergoing repair there and transfer your call to the right extension automatically. With ANI, the first person who answers your call can know your potential needs. And, many people who call in are not exactly facile and articulate, but with their file on the screen the agent can prompt them, so that less time need be spent on the phone."

Linking PBXs to Databases

Fieldman's comment points to a future for digital PBX's novel features beyond telemarketing. Many corporate organizations could benefit from smarter telephone answering and call routing. But exploiting these capabilities requires a request and status link connection between your PBX and your database computer. Such connections are surprisingly uncommon.

"Usually, you find an MIS department which owns its hardware and a separate telecom group, and the two aren't merging their products," says Bill Lucas, telephone systems supervisor for Amoco Corp. in Chicago and head of the AT&T Definity/85 Users Group. "That's just the way it's always been." Another user group official said he didn't know of any PBX users with computer integration.

Vendors are certainly making plans for when the users discover computer integration. "We want to make a switch and not a processing device, and I think most of the other PBX manufacturers will go that route," says Joe DiGraziano, manager of sales engineering at Mitel Corp. in Boca Raton, Fla. "Most will have their own agreements with off-board processor makers for integration purposes."

IBM, for one, announced in May that it has developed CallPath Services Architecture, a protocol for linking processors with PBXs. Initially, it works with the IBM AS/400 and PBXs from Northern Telecom, Rolm Co. and Siemens AG. IBM says it will develop versions of CallPath for its various lines, from the System/370 mainframe down to the PS/2 micro. IBM also says it has been working with AT&T to integrate AT&T's Adjunct Switch/Application Interface (ASAI) protocol with CallPath. Fieldman and Subbloie are both building products around the CallPath architecture.

□ WITH ANI, THE FIRST PERSON WHO ANSWERS YOUR CALL CAN KNOW YOUR POTENTIAL NEEDS.

Burstyn at the Business Research Group points out that ASAI, CallPath, Northern Telecom's ISDN/AP and other formats provide the tools for a new "virtual" generation of PBX. That's because the combination of digital hardware and new software tools has transformed PBX from a dumb switch to an applications tool, one that IS groups will be closely involved in implementing.

Although advances are being made in software, most analysts agree that no dramatic technological changes are likely for PBX hardware in the next five years. For one thing, vendors have learned from experience that giving customers an incentive to replace PBXs often results in losing that user to a new supplier.

"The whole field has decelerated, the rate of innovation has slowed and it's hard to get new ideas funded," warns Howard Frank, chairman of Network Management Inc., a systems integration firm in Fairfax, Va. There was a rush to get into the PBX market after deregulation in 1984, sparking a bloody price war that continues to this day.

Still, Ernest DeNigris, vice president at AT&T Communications Systems in Bridgewater, N.J., hints that the future might not be a desert of innovation.

"Some things are too proprietary to talk about—but the role of the PBX as [only] a provider of dial tones could change," says DeNigris. "Think of the PBX as being the point of access within the business to all kinds of sources of information.

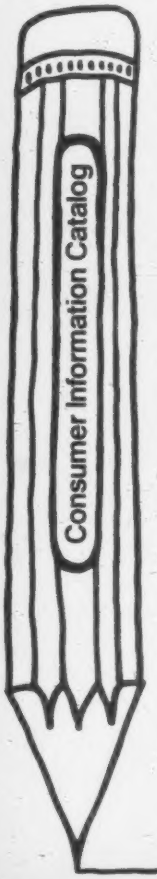
"I'm not saying we want to integrate with LANs and have the communications equivalent of the home entertainment center," continues DeNigris, "but rather leverage off our expertise in switching information." He predicts that the cost/performance of PBX bandwidth will mimic the improvements seen in computer memory—in terms of line capacity, rather than costs per line.

☐ **NO DRAMATIC CHANGES ARE LIKELY FOR PBX HARDWARE IN THE NEXT FIVE YEARS.**

"We don't see another new technology on the horizon," says James R. Mackey, director of applications, marketing and requirements at Rolm in Santa Clara. "We're going to optical fiber and satellites and those kinds of transmissions, but that's not new technology to us. In our view, what's important is having memory, speed and bandwidth."

Further than five years out, optical switching and other technologies may bring profound improvements in memory, speed and bandwidth. But, for the near term, the action is sure to be centered on applications development. "When general computers came out, they moved from crunching numbers in the back office to real application engines involved in how people did business—and that's what's going on in the PBX market," comments Rick Faletti, vice president at Northern Telecom in Richardson, Texas. Users will be seeing more PBX-to-host connectivity so that the handling of calls can be completely customized, he says. He also predicts wireless PBX connections and phone numbers that follow you from your home, to your car phone and into the office.

While digital PBX hardware will remain recognizably the same for a while, it will be easier to integrate into an information system and will offer data of specific interest to IS. Unless, of course, you continue to see PBXs as "that thing the phone operator sits behind."



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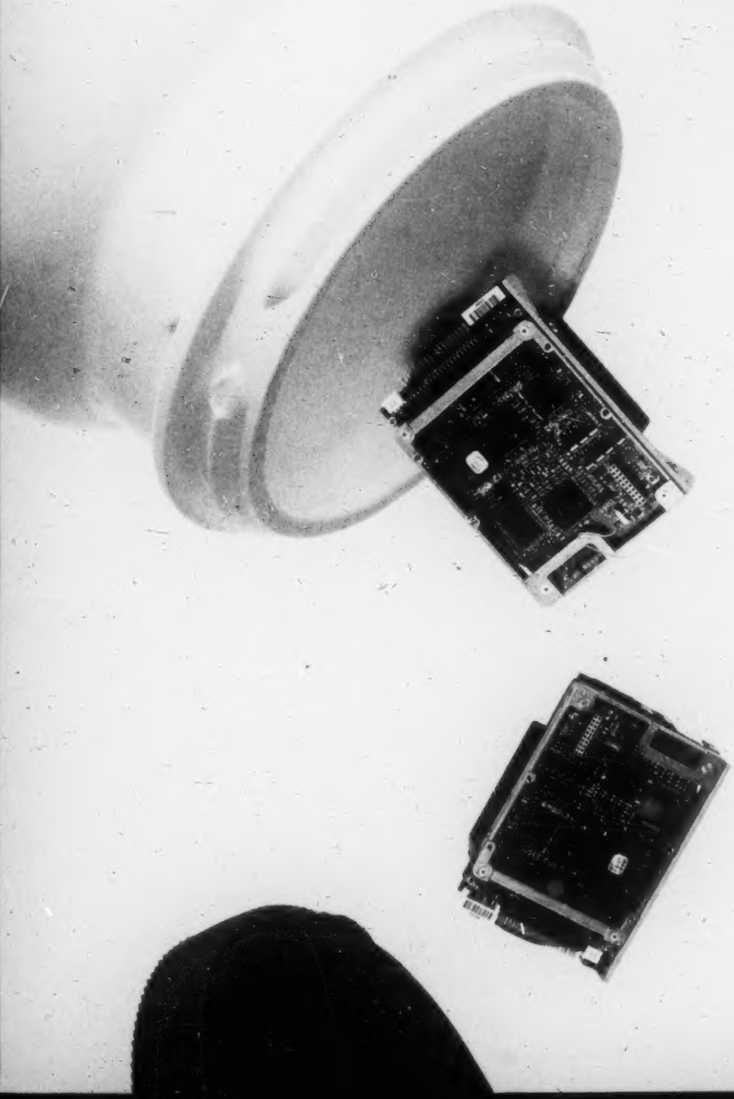

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1990

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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Berkeley's Katz could improve read performance dramatically with RAID Level Five.

Relief for Slow Storage Systems 22

BY JEFF MOAD To help disk subsystem performance keep up with ever speedier CPUs, some are turning to a new type of storage architecture—Redundant Arrays of Inexpensive Disks. But will the cure be worse than the problem?

Cover photography by David Bradley

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INSIGHTS ON DISTRIBUTED COMPUTING

The aim is to off-load as much processing as possible to the intelligent desktop machines, leaving only the shared information and software for managing it at the server.

George Colony
Forrester Research Inc.
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Today, we have a world where the network itself attaches computing resources. Those resources may or may not be in the same location. They may be PCs, workstations or servers, and still others may be mainframes.

Howard Frank
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We're trending toward LANs, and we're being asked to support mission critical applications on them.

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DATAMATION
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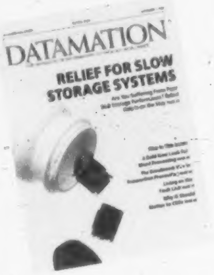
INSIDE DATAMATION

A Solution to a Storage Problem

We've all heard about the virtues of multiprocessing and reduced instruction set computing. These advances in computing can provide users with productivity and performance gains. But these gains haven't come without costs. And one of the costs has been in the interplay between central processing units and disk storage subsystems.

The problem has been that RISC- or multiprocessing-based processing units are often not well matched to storage, leading to time lags between requests for data and availability. The bottom line, of course, is that computer power has not been used efficiently and effectively, an expensive waste of MIPS.

But as our cover story this issue, "Relief for Slow Storage Systems," page 22, shows, the spark of innovation is alive and well in the industry, and help is on the way. Says senior writer Jeff Moad, "Several leading systems vendors have embraced an approach that could help eliminate the expensive mismatch between CPU and disk subsystems. The idea is to redesign the subsystems: rather than basing them on large, expensive disk drives, as many now are, use arrays of many inexpensive 5¼-inch or smaller hard disks similar to those currently used in PCs and workstations. Proponents say a move to such so-called redundant arrays of inexpensive disks (RAID) could significantly improve disk subsystem performance and revolutionize data availability."



TAKE TWO and storage in the morning

Already, prestigious companies such as Compaq Computer Corp., Control Data Corp., Data General Corp., IBM, Memorex Telex Corp., Storage Technology Corp. and Tandem Computers Inc. have started development on RAID technology or have actually announced plans to ship an array design. Even though actual, usable products may be a ways off in most cases, a technological solution to the problem of poor disk storage performance is coming.

RAID takes up less space and power than do larger disk systems, and have the potential for what Moad calls fault-tolerant data storage and for increased data transmission rates, among other advantages.

All in all, RAID technology may be the solution for an important class of storage problems. It's now up to the companies developing this technology to follow through, test their approaches with users and provide viable products to the market.

Of Client/Server Software

The rubber meets the road at the applications level. If the right software doesn't exist, then the job, however well-intentioned the hardware, can't be done. This is particularly true in so-called client/server computing, where the available applications software has not caught up to the capability of existing hardware.

But there is some evidence now that the applications shelves are starting to be stocked. As our Dallas-based PC writer, Bob Francis, says in "Serving Up Vertical Software," page 45, small vertical applications software companies that had been teetering on the cutting edge have found their balance, providing products that may challenge their big-system forerunners in focused markets such as accounting, banking and manufacturing.

That's good news for companies trying to distribute their computing resources. So tune in to Francis' article to find out what may be in store for you.

David R. Brousell, Editor

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Serving Up Vertical Software

Despite all the talk about client/server computing, few vertical market software packages have actually been shipped. But the selection is growing wider as more users rethink their future systems strategies.

BY BOB FRANCIS

Consider it the computer industry's version of *The Never Ending Story*. Just as software lagged behind hardware in the mainframe and minicomputer worlds, applications are now hard to find for today's client/server hardware. A few general purpose database packages are available, but the selection of vertical software, targeted at the needs of specific industries, is practically nonexistent.

Demand for such applications is growing, however, causing a number of vendors to focus on vertical markets such as accounting, banking and manufacturing.

"These companies have sprung up much faster than we had expected, and they've begun to be recognized," says David Kaplan, product manager for Redmond, Wash.-based Microsoft Corp.'s SQL Server. According to Kaplan, many of the client/server software pioneers are successfully selling vertical market products, even though some of the elements of client/server computing are yet to be set in cement.

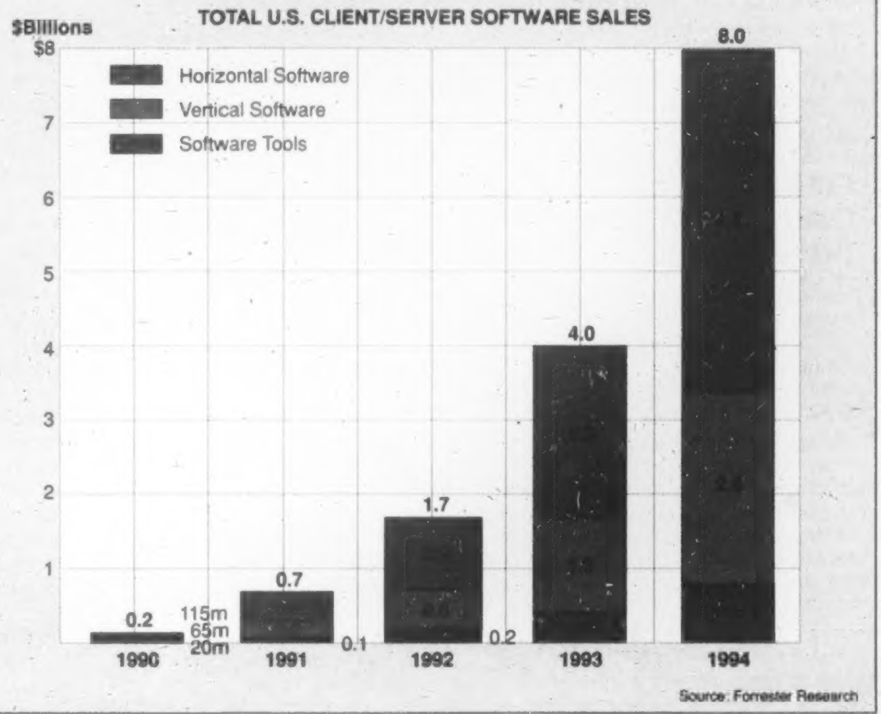
Off the Edge

A year ago, many client/server software providers were considered so far out on the cutting edge that they threatened to fall off. But, today, these same companies are not meeting the resistance they once did from customers seeking more conventional, mainframe-based applications. "We've seen a change in the last six months. The RFPs [requests for proposals] coming out now are saying they prefer an SQL engine and a graphical user interface. . . . It's not 100% of them yet, but there's more of them now than there were just a year ago," says David Duffield, president of PeopleSoft Inc. of Walnut Creek, Calif.

A survey of IS managers done for DATAMATION by the Wall Street investment firm Cowan & Co. confirms this shift toward distributed computing. In the survey, respondents said they were targeting desktop PCs and workstations for a greater percentage of their applications development budget. Survey results show that 18% of new applications will be implemented on PCs and workstations through 1991, while 64% will be run on mainframes and 18% on minicomputers. For the longer term, PCs and

Big Bucks for the Software Business

Horizontal software packages lead the market overall, but vertical products will still constitute a billion-dollar market by 1993.



Source: Forrester Research

workstations will garner 27% of future development work. As this trend takes hold, it will allow software companies focused on the vertical client/server market to start small and grow as businesses implement the model companywide.

Flexibility Counts

Still, despite the tilt toward distributed platforms, the Cowan survey indicates the mainframe is far from dead, and the move to client/server computing will not be instantaneous. Consequently, many of the vertical software companies are creating products that can adapt to various computing models.

PeopleSoft's human resource management software is an example of the flexible approach that some providers are taking as the transition to client/server systems takes hold. Its software can run with IBM's DB2 mainframe system, as a New York state database of 1.2 million persons demonstrates. But it can also go on a stand-alone workstation running Microsoft's Windows or OS/2. "That's part of the beauty of it and, in addition, it gives us a much larger sales target," says PeopleSoft's Duffield. "We're not limited to companies that have implemented client/server computing throughout their organization. We can come in on a workstation and later add DB2 capabilities."

What Some Early Birds Want

While an evolutionary transition will make sense to many potential users, a few companies are jumping headfirst into client/server computing as they seek to cut costs and deflate bloated management structures. Eastman Kodak Co., in Rochester, N.Y., is one of those. It's struggling to transform itself into a swiftly moving global company and has bet heavily on client/server computing to get there.

> ☐ THE MOVE TOWARD CLIENT/SERVER COMPUTING WILL NOT BE INSTANTANEOUS.

When Kodak first embraced client/server computing in 1988, few packaged software products were available. Today the film company uses PeopleSoft's human resources software in some locations and is also a large user of a client/server MRP II manufacturing offering from Fourth Shift Corp., a manufacturing software company based in Minneapolis.

Implementing the MRP II package hasn't all been easy, but not for technical reasons. "It's been more a question of culture change and less a question of technological change," explains Jack Philben, Kodak's manager of decentralized manufacturing support systems.

According to Les Hellenack, an analyst at International Data Corp. in Framingham, Mass., cultural challenges will eventually overshadow today's more technical concerns. "Kodak really broke some ground when they began implementing this system at their manufacturing plants. Basically, their local plant managers are now more responsible for a plant's performance than they were when data processing was handled centrally. That meant some real changes in the way these plants operated, and that's going to happen wherever this model of computing is implemented," Hellenack warns.

Taking Client/Server to the Bank

An industry where client/server systems are just beginning to stir is banking, possibly a natural market for decentralizing computing technologies in view of the inherently distributed nature of branch banking operations. Several software vendors are pushing client/server computing in this area and regard branch banks as their ticket to success. Banking automation vendors such as NCR Corp. are committed to the client/server model across their entire product line, according to Henry McClain, NCR's director of branch automation systems.

Nevis Technologies Inc., a two-year-old Culver City, Calif.-based software company, also hopes to cash in on the banking market. Nevis recently delivered a pilot version of its Nevisys package, which allows banks to customize retail branch banking application, to two original equipment manufacturer customers: Nixdorf Computer AG and Wang Laboratories Inc. Both OEMs will bundle Nevisys, which bases its networked PC technology on Microsoft's OS/2 LAN Manager, with their own server hardware and networking systems, says Richard B. Ghastin, Nevis' chief financial officer.

Ghastin admits that in banking, as well as in other sensitive applications of client/server computing, security will be a key priority. "That's obviously a big issue for banks, but the technology is going to be there to solve that problem," he predicts. Ghastin expects that future storage systems and agreements among vendors to establish standards will specifically address security issues.

In Search of Tools

Despite growing customer interest in vertical applications, even the most ardent supporters of client/server comput-

What Qualifies as Client/Server, Anyway?

Any discussion of client/server computing would be incomplete without a definition of the model. While many people have their own interpretations, most experts agree that client/server computing splits the processing of an application between a front-end portion executing on a PC or workstation and a back-end portion running on a server. The front end typically handles local data manipulation and maintains the user interface, and the back end handles database and other number-intensive processing.

"The aim is to off-load as much processing as possible to the intelligent desktop machines, leaving only the shared information and software for managing it at the server," says George Colony, president of Forrester Research Inc. "The client fulfills users' need for independence, computing power and a user friendly interface, while the server fulfills the corporation's requirements for cohesion, making certain information is backed up and databases are synchronized, protected and secure."

According to Colony, most client/server systems are designed for PCs and LAN-based operating systems or for UNIX-based servers and workstations. By 1992, Colony predicts that on the server side, 60% of client/server operating systems will be based on OS/2; 30% will be running UNIX; and the remaining 10% will run Digital Equipment Corp.'s VMS, IBM's MVS, or other proprietary operating systems.

Landmark Graphics Corp., a Houston-based computer-aided exploration company, counts itself in the UNIX camp. It uses IBM and Sun workstations to deliver computer-aided exploration software to oil companies. According to Landmark's president, C.E. "Gene" Ennis, Landmark's client/server approach is beginning to pay off. "More and more oil companies are beginning to standardize on this architecture for their new purchases. When we started [in 1985] we were really kind of out on a limb."

ing admit that not all the elements are in place to make it a major industry force. Terry Peterson, vice president for field support services at Fourth Shift, for example, is waiting for the same quality of development tools that he remembers from his mainframe background. "We still need better LAN diagnostic tools," he says. "And we need some platform enhancements—network managers to database managers—combined with the new server technology to transform current client/server implementations into online transaction-processing engines."

Technology is being developed to resolve some of those issues, says Mike Clark, director of systems engineering at Houston-based Compaq Computer Corp. "Our agreement with Novell is one effort aimed at that end for the SystemPro and other client/server computing architectures," Clark says. This agreement calls for Novell Inc. and Compaq to develop fault tolerant LAN functions, putting client/server systems more directly in competition with mainframes and minicomputers for vertical applications like on-line transaction processing (see "Living on the Fault LAN," p. 77). Results from the agreement are expected by late 1991 or early 1992.

Enter the Minicomputer Makers

Like Fourth Shift's Peterson, who describes his own sudden and complete conversion from the mainframe world to the client/server community as a "Saul to Damascus" experience, the client/server model is rapidly finding converts among traditional minicomputer suppliers. Fourth Shift has signed a distribution agreement with Data General Corp. which will port Fourth Shift's products to its UNIX software platform, AViiON. Eventually, Fourth Shift will port its products to the client side of OS/2. "The real benefits of OS/2 and UNIX, over and above our current DOS implementation, is the concurrent . . . processing that it will provide," says Peterson.

> ☐ IT'S BEEN MORE A CULTURE CHANGE AND LESS A TECHNOLOGICAL CHANGE.

Meanwhile, Hewlett-Packard recently signed an agreement with PeopleSoft, which also happens to be an IBM business partner, demonstrating that IBM also has its eye on the technology.

Although the blossoming of client/server computing is sure to invite a flood of software competitors, the early entrants feel confident in their lead. Says PeopleSoft's Duffield: "We think we have a good two- to three-year head start before the competition begins to catch up." Nevertheless, the competitors are on the horizon. One of Fourth Shift's primary competitors, for example, is ASK Computer Systems Inc., a Mountain View, Calif., software supplier that started in the minicomputer business and is shifting its development toward more distributed computers and databases.

According to George Colony, president of Forrester Research Inc. in Cambridge, Mass., many such mainframe and minicomputer companies are beginning to see the light. "ASK moved pretty quickly, and others are going to follow," says Colony. ▭

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Living on the Fault LAN

Here's what you can do today to build in some measure of crash protection for LANs and a look at what's coming in disaster insurance from leading network vendors.

BY SUSAN KERR

When a local area network (LAN) crashes, the consequences of data loss and lost work time can be intolerable. That's why a growing chorus of IS managers are demanding more fault tolerance from LANs.

A study of 100 IS and network managers at *Fortune* 1,000 companies completed last year by Santa Clara-based Infonetics Inc. for communications test equipment vendor Network General Corp. of Menlo Park, Calif., found that LAN downtime in large companies causes average yearly revenue losses of $606,000 and employee productivity losses of $3.48 million. It also found that the average network is disabled 6% of the time.

Nothing on the horizon will put LANs in the same fault-tolerant league as one of Tandem Computers Inc.'s mainframe systems, but uninterruptible power supplies (UPSs), disk mirroring and disk duplexing can make LANs less vulnerable today. Both Novell Inc., which already has some fault-tolerant features in NetWare network operating system, and Microsoft Corp. will be improving this aspect of their network software in future releases.

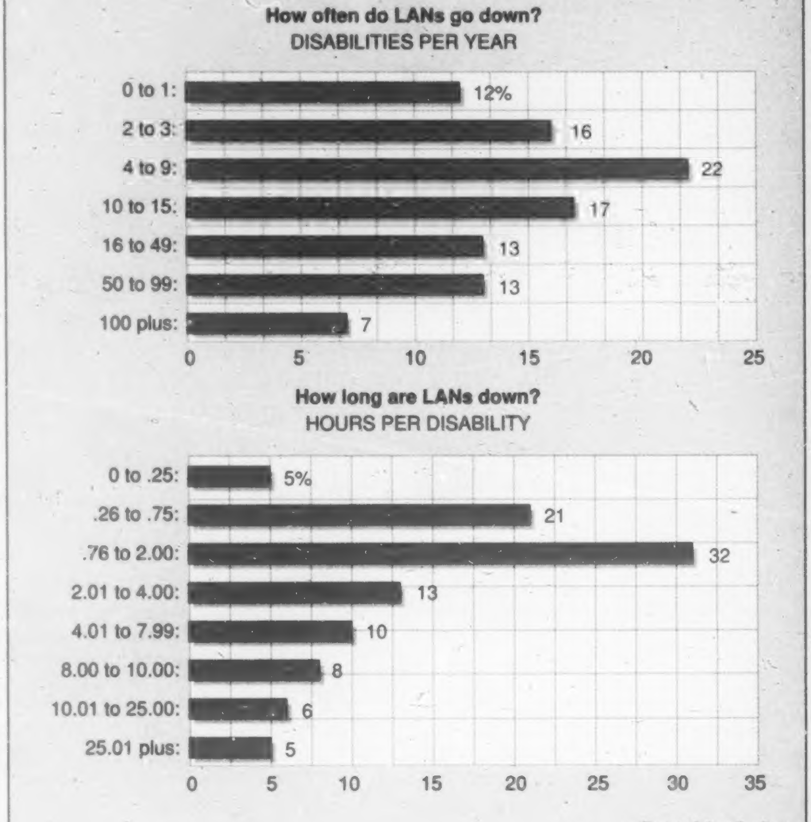
"We have asked for this," says Jawaid Ekram, manager of systems engineering for Chicago-headquartered Covia Partnership. His organization provides the Apollo computer reservation system for United Airlines Inc. and is a major supporter of token ring networks and Microsoft's LAN Manager. Covia currently depends on home-grown safety features, but Ekram wants more products out on the market so that he can store more data locally at airports and travel agencies rather than on central corporate host computers. "Microsoft is doing this [fault tolerance] under pressure," he adds.

That pressure is being felt by many

Illustration by Chuck Morris

Why IS Managers Want Fault Tolerance

A study of 100 LAN users reveals that most experience 10 or more LAN failures yearly. Almost a third of failures lasted from 45 minutes to two hours; 42% lasted longer than two hours.



Source: Infonetics Inc.

LAN vendors, including IBM. Although Big Blue currently has no fault-tolerant products, it will when it completes the merger between its OS/2-based LAN Server and Microsoft's LAN Manager. Fault tolerance is one of the biggest requests IBM gets from LAN customers, says Alastair Watson, IBM LAN systems architect based in Austin, Texas.

Microsoft's most recent offering, LAN Manager version 2.0, features the company's first attempts at fault tolerance, meaning that the product's resellers (including Digital Equipment Corp., 3Com Corp. and Ungermann-Bass Inc.) also will be endorsing the concept. Novell, which offers the System Fault Tolerance (SFT) NetWare operating system for 80286-based servers and networks, now is making those features standard in its NetWare 386 3.0 platform.

Protecting the Server

As applied to LANs, the term *fault tolerance* is misleading, says John Erlandson, product marketing manager at Ungermann-Bass, which is now part of Tandem. Mindful of his parent company's business, Erlandson feels more comfortable describing what the LAN vendors do as "building redundancy" into the network rather than guaranteeing that no matter what happens, no data will be lost.

This redundancy is designed to overcome known weaknesses in networks. David Thacher, senior product manager for Microsoft's network business unit says the three most common problems in a server-based environment are power outages, disk drive failures and drive controller board failures. Users seem to have the same list of complaints.

Uninterruptible power supplies can take care of the power issue. Disk mirroring and disk duplexing can do the same with disk drives and controllers. Disk mirroring means the server contains duplicate disks, and all information is written to both simultaneously. Disk duplexing means that the controller is duplicated.

Even if you have no need for these features, it's always smart to think ahead about what you'll do when the server goes down.

Good backup procedures are No. 1 on the list so that, if the network goes down, only a limited amount of work will be lost. United Airlines' corporate staff, for example, performs daily backups. Also standard at United is the practice of having spare PCs or servers ready to be used at a moment's notice.

Good network design can also serve as a safeguard, whether it means placing servers in protected, out of the way areas or making sure cables are not out and about where users can roll their chairs over them. Likewise, network design also includes designing your backbone so that if one link goes down the network can reroute over another link.

Although some might add human error as a cause of concern, most vendors say that they are limited in what they can do on that score. It's up to users to have good security and backup procedures in place. Thacher says, "You can only protect against pilot error to some extent. If the pilot aims the plane to the ground, it'll crash. It's the same scenario with a network administrator."

☐ WE DON'T WANT TO PROMOTE SERVER MIRRORING. WE WANT RELIABLE SERVERS.

The minimal level of server protection may appear to be relatively easy to provide, but in practice it has proved difficult. Disk mirroring, for example, has been less than satisfactory.

At Kemper Financial Services Inc. in Chicago, PC research analyst and consultant Chris Harnack recalls some problems his company had with Novell SFT software and disk mirroring. "The one time a disk failed, mirroring didn't help," he says. "It mirrored the failure into the other disk, wrote something incorrectly, and then the system wouldn't boot."

Mirror, Mirror on the Net

Novell's 286 SFT NetWare is known to have bugs, including problems in remirroring disk drives larger than 250 megabytes. Reportedly, 386 NetWare addressed these issues. Time will only tell what success Microsoft will have in avoiding major problems.

Many users prefer an alternative in fault tolerance. The most common request is for server mirroring, in which there are duplicate servers. Users feel this would offer greater protection since the potential for failure is not concentrated in a single box.

But this technology is a touchy subject

for the major LAN vendors. Microsoft is not even attempting to deal with the issue of server mirroring right now, calling the approach expensive and not very efficient. But some users, like Covia, expect that the software company will have little choice in the matter.

Novell has long talked about server mirroring but has yet to deliver. Now it says it will not offer server mirroring for its 286 server but promises to make it available for 386 users in 1991.

3Com also has been bitten by server mirroring, having announced it in March 1988. The company that was developing it, Atlantic Microsystems Inc. of Salem, N.H., is no longer around, and the idea has been dropped by 3Com. As a development partner of Microsoft's, 3Com will instead push what is in LAN Manager.

Microsoft's Thacher doesn't like mirroring at all. What he would prefer to see instead is improved database technology where a database is stored across the network on different servers and kept current.

Obviously, keeping two—or even more—servers synchronized is a tough job. One way vendors try to get around the issue is to maintain that their products are so reliable there is little need for server mirroring.

"We don't want to promote server mirroring since we want to promote reliable servers," says Jim Lima, a 3Com product manager. His fellow product manager, Frank Howley, adds that the mean time between failures for the latest generation of 3Com servers is greater than eight years. Thus, he says, hardware has gotten remarkably reliable.

This is certainly the argument repeated by Digital's Ethernet LAN product marketing manager Stephen Allen. "For the majority, it's like wearing a belt and suspenders at the same time," he says. "It [fault tolerance] could be overkill."

A Difference of Opinion

Maybe. But a growing base of network users seem to want that "overkill." And their demands are becoming more urgent as they transfer some of their dependence from large systems to PC LANs.

"We're trending toward LANs, and we're being asked to support mission critical applications on them," says Mike Carioscio, director of corporate automation for Kemper. "There's a gap here. You have all this good stuff on minis and mainframes, but it is not all there on PC LANs."

Adding to five stand-alone LANs already in place, the financial services company installed a token ring LAN this summer. This new network supports a new application that provides financial sales information to 100 Kemper representatives taking calls from brokers. "If that link goes down, we start losing money," says Carioscio. As a result, Kemper is seeking better fault tolerance by moving to NetWare 3.0.

The burden associated with downtime is related more closely to the nature of a company's applications than to the extent of its systems. The Hospital of the Good Samaritan in Los Angeles, for example, runs six small LANs under SFT NetWare, according to PC coordinator Joey Hayashi. Legally, the hospital must maintain (thus protect) certain records, leading to the decision in favor of fault tolerance.

On the other end of the spectrum, at United Airlines' corporate computer organization, information services manager Richard Sowiak is moving his much larger organization cautiously toward fault tolerance. "Our computing is not operationally critical to the running of the airline or the making of real-time decisions," he explains.

Still, on a 1 to 10 scale of importance, he ranks fault tolerance as a 7. His 400-person application development team depends on 12 token ring networks. If one of the file servers goes down, that could idle 30 programmers in one fell swoop. Thus, Sowiak is thinking of switching from his current IBM PS/2 model 80 servers to those from NetFRAME Systems Inc., which feature multiple CPUs.

Sowiak's organization currently protects itself by keeping spare equipment, which can be swapped in the event of a failure. Although problems have been relatively rare, Sowiak says, the advent of distributed computing in his organization will make him less tolerant of even the potential for disturbances.

Sowiak is not alone.

"If you're looking at a work group environment, disk mirroring will take care of the vast majority of problems," says Matthew Woods, owner of Computer-Ease, a Long Beach, Calif., company that designs networks for users. "But," he adds, "with the current trend of moving more and more corporate data onto PC networks from minis or mainframes, then you have a critical need for more safeguards." ▭

LAN Safety Checklist

These procedures can head off disastrous data losses in the event of a LAN failure:

- Design the backbone network to allow rerouting when one link goes down.
- Use uninterruptible power supplies on the server and even on individual workstations involved in critical processes.
- Physically isolate servers and cables so that people and furniture can't bump into them.
- Use disk mirroring or duplexing for server disk drives.
- Double cable for greater protection of critical links.
- Back up frequently!

NetWare vs. LAN Manager: Fault Tolerance

Fault tolerance is fertile ground for the continuing battle between Microsoft Corp.'s LAN Manager and Novell Inc.'s NetWare software.

Standard on NetWare 386 version 3.0 are features previously available in Novell's 80286-based SFT NetWare. These include disk mirroring, disk duplexing and a uninterruptible power supply (UPS) monitoring facility. New and only available for NetWare 386 (although previously announced but never delivered for the older system) is server mirroring. All NetWare software contains a "hot fix" ability, which means that if a problem is detected on a piece of disk media, the data is remapped to a predefined, presumably safer, section of the same disk.

While Novell has had the lead in fault tolerance, LAN Manager is picking up on many of the same features. Fault tolerance was not offered in previous versions of LAN Manager; it has been added to LAN Manager 2.0, which became available this summer.

Microsoft has added hot fix, disk mirroring, disk duplexing and UPS support. In addition, it has one feature not available in NetWare called the Replicator. This allows an administrator to designate files on a server that will then be copied automatically to another server. This differs from server mirroring in that the whole disk is not being copied and the file must be closed before being replicated. Thus, it is not synchronous and not a true fault-tolerance measure, but it could come in handy.

Insurers Rewrite IS Policies

In the approaching wide open market, insurance giants see information technology as a vital means of beating their rivals to the punch with policy sales.

BY JOHN LAMB

The fragmented European insurance industry is getting its act together.

The past two years have brought an avalanche of mergers, alliances and overseas ventures as the 4,000 companies that compose the European industry struggle to get in shape for the post-1992 unified market and brace for the stiffer competition that will ensue in the race to secure the business of 325 million consumers.

As the wheeling and dealing intensifies, information technology (IT) is emerging as a key element in the game plans of insurance industry executives. "I believe that the use of information technology will increasingly play a crucial role in enabling our underwriters and brokers to exploit the many opportunities that will undoubtedly present themselves," says Murray Lawrence, chairman of the historic Lloyds of London.

Others maintain that successful exploitation of information systems is already a deciding factor in the industry. "Up until two years ago, few companies had a business strategy that linked with IT; most companies had fairly reactive strategies. Now you can't tell the difference between business and IT strategies," says Jeff Watkins, a researcher in management studies at Bristol University in Britain, who has just completed a study of the use of IS in the British insurance industry.

Watkins maintains that up until now some of the most successful insurance companies have had miserably inadequate IS strategies, with computer power being confined to administrative tasks. That is changing, he claims, as some companies begin to invest heavily in "competitive edge" systems. These systems often link salespeople's portable PCs to client databases or deliver comparative information about a variety of insurance policies from a number of companies via electronic data interchange (EDI) networks. "Over the next three to four years, we will see a division between leading edge companies and those who have lagged on technology," he says.

IMPACT '93

PRUDENTIAL'S MORRIS: For the insurance industry, 1992 is a concept, not a date

Big Bucks for IS

The cost of entering the technology is not cheap. One network, based in Brussels, Belgium, the European Reinsurance and Insurance Network (RINET), which delivers an EDI service across the Continent, charges a one-time membership fee that works out to around $425,000 per company. But major players in the insurance industry have deep pockets. IS spending in those companies is currently running at around 2% of their annual gross premium income, Watkins estimates. That gross income ranges within Europe's top 10 from the $6 billion at the U.K.'s Sun Alliance up to the $16 billion at West Germany's Allianz.

Some companies whose pockets are not quite that deep are merging with other insurance industry players to give themselves greater IS investment clout. "Companies are launching takeover bids like fury as [investing in] IT becomes increasingly important in selling policies," says Bob Carter, professor of insurance at Nottingham University in Britain.

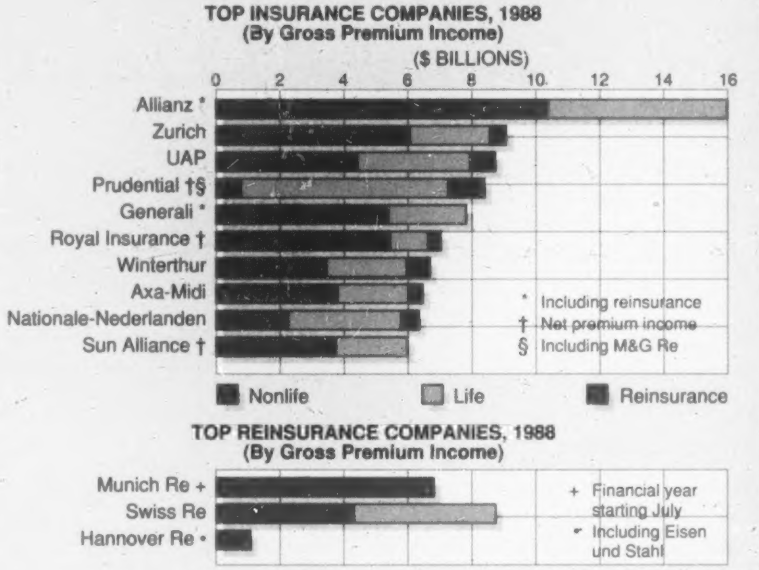
No one can afford to take any chances when it comes to meeting the challenge of pan-European marketing and administration. The European Commission is beginning to create a single insurance market in Europe out of the wildly differing national markets. This involves sweeping away the regulatory cobwebs in each country that snare foreign insurance companies. So far, for example, the commission has eliminated prohibitions on European insurance companies wishing to set up branches in neighboring countries. The next step for the commission is to make it possible for companies to trade across borders without necessarily having offices in both countries.

The commission is also trying to step up the pace of IS innovation aimed at contributing to a pan-European insurance market. As part of its Research in Advanced Communications in Europe (RACE) program, the commission is paying for the development of a standard electronic case-handling system. The RACE project involves six collaborators, headed by Philips International, a Dutch insurance company. The partners are working on a system that will support 10 to 15 insurance employees working on distributed workstations via broadband fiber optic cable. The workstations, equipped with graphical user interfaces displayed on high-definition monitors, will deliver data, images and voice relating to all aspects of insurance policy administration over Internet and Fiber Distributed Data Interface (FDDI) local area networks. Custom-built software for the project will facilitate program-to-program communications and provide procedures and guidelines that will help case workers handle their files more effectively.

☐ ONE INSURANCE EDI NETWORK CHARGES EACH COMPANY $425,000 PER YEAR.

The Giants of Europe

Financing new insurance administration systems should pose little problem for Europe's top 10 insurers, which have gross premium incomes ranging from $6 billion to $16 billion.



Source: *The Economist*, February 1990

Passports to Profits

The European insurance business is divided into three distinct sectors: life, nonlife and reinsurance. Life includes savings, pensions, health insurance and normal life insurance coverage. Nonlife (property and casualty insurance in the United States) includes individual and corporate coverage for houses, cars and factories, as well as liability insurance for damage that a policyholder might cause. Reinsurance is essentially the insurance that insurance companies take out to protect themselves from claims.

Whatever the insurance sector, much remains to be done before European insurance companies can reach the goal of having a single European "passport," as the concept of being able to sell a single insurance policy in a unified market is called. They will have to simplify their products, sort out currency differences and find new ways to distribute their wares, says Ernest Morris, group general manager for management services at The Prudential, Europe's third largest insurance company. "In the insurance business, there is a hell of a long way to go before there is a single market: 1992 is a concept, not a date. My impression is that those companies that do have operations in several countries arrange IT on a country-to-country basis," says Morris.

These companies will need to broaden their internal corporate IS strategies to include a range of business partners, asserts Bristol University's Watkins. Such industrywide IS strategies will enable insurers to capitalize on their systems by making it easier to deal electronically with external sales outlets, such as banks.

Insurance companies of all stripes are finding that networking is a more cost-effective way of reaching their sales outlets and, ultimately, customers: This is no surprise, since their highest cost, after the money they pay out in claims, is the cost of sales. In Britain, for example, each £1 a salesperson collects in commission from the company for the sale of a policy yields a measly 50 pence for the shareholders over the entire life of the policy, according to *The Economist* magazine. The U.K. alone has four networks that feature specialized services solely for retailers of life and nonlife insurance. Run by British Telecommunications PLC, Digital Equipment Corp., IBM and the AT&T-owned Istel Ltd., respectively, these value-added services pump information from U.K. insurance companies to more than 30,000 retail outlets, reducing administrative costs for the insurers. Rather than having to contact a number of insurance company employees in different departments to get information, the brokers and financial institutions that access these networks from PCs or videotex terminals can compare contracts, inspect premium rates, receive advice and exchange basic policy details using data from mainframes operated by the country's insurance companies.

Still, to get the most out of such new technologies, IS will have to do a better job of selling itself, both internally and externally, some surveys indicate. The surveys show that not all of the industry is sold on information technology. A survey carried out by Meridian Computer Services (MCS), a London-based software company serving the insurance business, found that many retailers were ignorant of the networks. Some 80% of brokers were undecided about which one to use or had not even heard of their existence, according to MCS.

☐ OUR MAJOR SYSTEMS THRUST IS BETTER IT SUPPORT FOR THE SALES FORCE.

Other reports have questioned the quality of information management in

The Urge To Merge

Joining forces outside their home markets seems to be the most attractive way for Europe's insurers to acquire the investment clout they need for new IS strategies.

COMPANY	1988 PREMIUM INCOME ($ Billions)	MERGERS
Allianz (W. Germany)		
Italy	$2.10	Bought 51.5% of RAS between 1984 and 1987
Britain	$1.16	Bought 100% of Cornhill in 1986
Spain	$0.35	Signed cooperation agreement with Banco Popular in 1988. Bought 51% of Ercos in 1989 ($60 million in premium income in 1989)
France	$0.31	Bought 50% of CNM's insurance interest in 1989 ($1.4 billion in premium income in 1989)
Generali (Italy)		
France	$1.41	Bought 17% Compagnie du Midi in 1988 (owns Equity & Law of Britain and merged with Axa-Midi
W. Germany	$0.86	
Britain	$0.64	
Spain	$0.25	
UAP (France)		
Spain	$0.14	To buy Gesa in 1990
W. Germany	$0.13	Bought 34% of Groupe Victoire in 1989 (controls Colonia Group, $4 billion in premium income in 1989)
Italy	$0.12	Bought Allsecures in 1989
Britain	n/a	Bought 25% of Sun Life in 1988*
Prudential		
Italy	$0.101	Joint venture with Benetton in 1988; restructured with L'Abeille (Group Victoire) in 1990

*Current stake

Source: *The Economist*, February 1990

the insurance industry. Jeremy Dickson, a partner at Coopers & Lybrand Deloitte, a U.K. accounting firm, claims that many companies are operating 10- or 20-year-old systems and are postponing upgrades because of the time and cost involved.

But insurance company executives cannot be entirely blamed for failing to come to terms with IS, according to a second survey. A study by KPMG Peat Marwick McLintock found that an average of $6,000 was spent per employee each year on IS at the top 50 U.K. insurance companies. But "hardly any" of that money was spent on educating management about IS.

Combating Technophobia

Indeed, the trend toward end user computing has yet to result in a comparable distribution of IS skills, says Vernon Bryce, human resources group manager at Peat Marwick. "Management in insurance operates in a very traditional, hierarchical way. But IS is requiring them to manage in a different way that fits the new market requirement mentality," Bryce observes.

Management technophobia is not distributed equally throughout the insurance industry and is less of a problem in the reinsurance sector. Of the 80 companies that applied earlier this year for services from the RINET network, 45 were reinsurers, 29 were insurers and six were brokers. Xavier Dereppe, RINET's general manager, was optimistic that the service will win friends as it comes on line this year. RINET is aiming for more than 200 corporate users that will exchange electronic mail messages and transfer files via host systems or PCs.

☐ THERE'S A LONG WAY TO GO BEFORE THERE'S A SINGLE INSURANCE MARKET.

Companies in the life insurance sector, which rely on salesmanship and a competitive price to succeed, have tended to lead in IS applications. Over half the life companies in Britain, for example, have installed a myriad of new applications software in the last couple of years, well ahead of the other sectors of the industry. "The major part of our systems thrust is improving the IT support to our sales force," says Morris of The Prudential. The trend in the company is toward client-based databases; that is, databases arranged around customers' names rather than around the company's various types of policies.

The Prudential sales force works from home, using handheld machines that can upload and access the data from branch systems, Morris says. The handheld machines play a vital part in what The Prudential calls "front-room salesmanship," allowing salespeople to perform instant calculations showing potential customers the policy options open to them.

Morris sees IS supporting three key elements of the insurance business: the product, its administration and its distribution. "We are trying to make it much easier to make the changes in administration that result from changes in a product. The key thing in administration is cost reduction, which we can cope with," he explains. "But in distribution there is a certain amount of ferment: VANS [value-added network services] and EDI are causing people to look at their systems [differently]. Data communications mean you have to enter a new world in terms of system availability and screen layouts."

Image processing, too, is a key technology for the future of the insurance industry, and one that is high on the list of vendors such as IBM. Efforts to cut down on paperwork will benefit more than just the bottom line, says IBM's insurance industry director for Europe, Peter Salinson. Europe consumes 40 million trees per year just to fuel its insurance business.

IBM is also working on expert systems to aid underwriters, but its main thrust is in developing a standard set of industry data structures based on its Systems Application Architecture (SAA). The structures would allow customer data to be processed with more consistency. "One of the problems the [insurance] industry has is how to protect its investment [in client data]. Information on a customer will often be held in eight or 10 different places," says Salinson.

In Europe, the insurance industry is beginning to realize that it can no longer relegate information technology to administrative back room functions. As Salinson says: "The question is how the industry is going to attract customers and get away from their old applications and to plug in new ones." Indeed, it is clear that being able to increase market share and engender staunch customer loyalty will more and more depend on an insurer's aggressive use of IS. ▭

John Lamb is editor of Computer Weekly in Sutton, Surrey, U.K.

The Year of the Notebook PC

Competitive smoke rose from most sectors of the Japanese information technology marketplace in 1989, with personal computing innovations the hottest.

BY STEVE McCLURE

Although the yen declined steadily in 1989 from a high of ¥120 to the dollar at the beginning of the year, Japanese IT suppliers relied heavily on selling their wares in the local market. In that economy driven by increasing domestic demand, the greatest amount of competitive heat was generated at the low end of the IT market as PCs and workstations invaded the traditionally paper-bound Japanese office with a vengeance.

In the next few years, competition among Japanese information technology vendors should flare up on the high end of the product spectrum, as well. The U.S.-Japan Super 301 trade agreement concluded this year, for one thing, should ensure that Japan's supercomputer vendors, Fujitsu Ltd., Hitachi Ltd. and NEC Corp., will face greater competition from U.S. vendors of supercomputing systems, such as powerhouse Cray Research Inc. In another high-end arena, a new mainframe line and operating system from Hitachi have signaled the company's intention to try to increase its share of the IBM-compatible market, both at home and in the United States.

As in many other parts of the world, systems integration emerged in 1989 in Japan as one of the fastest growing segments of the information technology market. Analysts see it as a key trend for the 1990s, with major IS suppliers poised to enter the field, following the lead of NTT Data, the only company in Japan so far to specialize in all aspects of systems integration.

The heat of domestic demand in 1989 did not fuel the top 10 vendors in Japan into growing as fast as they did in 1988. After enjoying 29% growth in 1988, Japan's top 10 companies grew 14% in 1989, from $43.6 billion to $49.7 billion, in dollar terms. When measured in yen, the growth rate was 24%, however. And once again the threshold for entry into the Japan 10 rose steeply—up 43% from Ricoh Co. Ltd.'s $1.12 billion in 1988 to Mitsubishi's $1.60 billion this year.

Fujitsu Gets Its Just Desserts

New financial information received from Fujitsu since publication of the DATAMATION 100 (in the June 15, 1990 issue) has boosted it to its usual No. 3 rank worldwide and No. 1 rank in Japan. Originally, DATAMATION's sources had estimated Fujitsu's total information systems revenues for 1989 at ¥1.57 trillion or $11.37 billion, placing the company at No. 4 in the world. The new figures put Fujitsu's sales for the year at ¥1.68 trillion, or $12.16 billion. Fujitsu's local sales, at 86% of its worldwide revenues, come to ¥1.44 trillion or $10.46 billion.

The Top 10 Suppliers in Japan

Fujitsu once again leads the top 10 vendors, which include Digital Equipment Corp. for the first time.

1989 RANK	1988 RANK	COMPANY	COUNTRY	1989 JAPAN IS REV	% CHANGE FROM 1988	1989 TOTAL IS REV	% CHANGE FROM 1988	JAPAN IS REV AS % OF TOT REV	% CHANGE FROM 1988	U.S. IS REV AS % OF TOT REV
1	1	Fujitsu	Japan	10,457.9	14.1%	12,160.4	10.6%	86.0%	2.0%*	8.0%
2	2	NEC	Japan	10,102.8	13.1%	11,480.4	9.6%	88.0%	3.0%*	6.0%
3	4	Hitachi	Japan	7,498.4	7.0%*	8,719.0	5.7%	86.0%	1.0%*	10.0%
4	3	IBM Japan	US/Japan	6,896.1	5.4%	9,513.7	2.6%	72.5%	1.4%	0.0%
5	5	Toshiba	Japan	3,951.8	11.0%	4,595.1	8.7%	86.0%	1.9%*	6.0%
6	6	Matsushita	Japan	2,931.0	9.2%	3,663.7	6.5%	80.0%	2.0%	12.0%
7	9*	NTT Data	Japan	2,254.0	33.1%	2,254.0	33.1%	100.0%	0.0%	0.0%
8	7	Nihon Unisys	Japan	2,112.7	2.7%	2,112.7	2.7%	100.0%	0.0%	0.0%
9	8*	Digital	United States	1,940.5	5.3%	12,936.7	5.3%	15.0%	0.0%	46.0%
10	11	Mitsubishi	Japan	1,600.3	6.7%	2,025.7	2.7%	79.0%	3.0%	15.0%

* Based on restated 1988 figures.
All currency figures are in millions of dollars.
Source: DATAMATION

Top Asian Achievers

Asian companies with the healthiest IS revenues

ASIAN RANK	WORLD RANK	COMPANY	TOTAL IS REVENUE ($ MILLIONS)
1	3	Fujitsu	12,160.4
2	4	NEC	11,480.4
3	6	Hitachi	8,719.0
4	13	Toshiba	4,595.1
5	14	Canon	3,783.3
6	15	Matsushita	3,663.7
7	24	NTT	2,254.0
8	25	Nihon Unisys	2,112.7
9	29	Mitsubishi	2,025.7
10	30	Oki	1,952.0
11	33	Ricoh	1,799.5
12	40	Seiko Epson	1,449.5
13	42	C. Itoh	1,345.9
14	72	CSK	520.0
15	75	Acer	493.7
16	86	Alps	420.4
17	94	Mitac	380.0
18	97	Kyocera	366.4
19	105	Sony	326.1
20	106	Nomura	322.0

No. 2 NEC Corp.'s domestic sales, which account for 88% of its worldwide sales, amounted to ¥1.40 trillion or $10.1 billion.

Meanwhile, Hitachi and IBM Japan switched places this year, with Hitachi moving up to No. 3 and IBM dropping to No. 4. Hitachi's Japanese revenues totaled $7.50 billion, up 7%. IBM Japan's domestic IS revenues were up 5.4% to $6.90 billion; its total IS revenues, which include sales to the rest of Asia, were up 2.6% to $9.51 billion. Strong sales in Japan of Toshiba Corp.'s notebook-sized computer helped boost its local IS revenues 11.0% and enabled it to keep ahead of NTT Data, which moved up from ninth to seventh place on the strength of its booming systems integration business.

Mitsubishi reentered the Japan 10 after slipping to No. 11 last year, thanks to improved earnings in the domestic market. Those earnings stemmed from Mitsubishi's concentration on the burgeoning "business computer" market, which in Japan includes any office computer that is not a mainframe.

Mitsubishi Enters at the Low End

Mitsubishi's improved status is no surprise, given that the popularity of low-end computers continues to grow by leaps and bounds as Japanese manufacturers come out with ever-smaller portables and better PC software. At the smallest end of the computing realm, Sony Corp. introduced the innovative Palmtop, a keyboardless machine that instead uses a graphics tablet under a liquid-crystal display that is activated by the touch of a stylus. Despite its information technology innovations, Sony's 1989 IS revenues were not sufficient to rank it in the Japan 10.

% CHANGE FROM 1988	NET INCOME	1989 EMPLOYEES
-2.0%	623.1	95,000
-2.0%	518.9	116,890
-1.0%	1,463.3	290,000
0.0%	739.5	23,019
0.0%*	935.0	142,000
-1.0%	1,570.1	193,088
0.0%	23.5	7,000
0.0%	34.1	8,181
-2.0%	875.8	125,900
-5.0%	488.5	89,500

Last year can appropriately be called "the year of the notebook computer," as many models of these lightweight, relatively powerful devices have taken the nation by veritable fire storm. Toshiba was first out of the chute in July, releasing its Dynabook, an 8.5 × 11-inch, paper-sized, 16-bit machine with a liquid crystal display screen. The machine weighs in at 2.7 kilograms and sells for about $1,200. The Dynabook's compact size and low price stunned the industry, and by the end of the year, Toshiba had sold 120,000 units. Soon a host of competitors entered the market: IBM joined the fray in October with its IBM 54499 Online Note, NEC introduced its 98 Note in November and this year Seiko Epson Corp. and Ricoh both started marketing their own 16-bit notebook computers.

Laptops were another highlight of the Japanese IS market in 1989. NEC introduced a color laptop, the 16-bit PC-9001LX5C, which has a price tag of roughly $4,800. So far in 1990, Toshiba has unveiled the SPARC LT, a laptop UNIX engineering workstation, and Sony has followed suit with a similar model.

Although UNIX has attracted the attention and investments of every major Japanese computer supplier, there is no more agreement in Japan as to which version of UNIX is best than there is in the U.S. market. An attempt to unite the two rival versions of the UNIX operating system came to grief in May this year, as Hitachi endorsed the IBM-backed Open Software Foundation version of UNIX, while NEC, Fujitsu and Toshiba chose to go the UNIX International route.

Some analysts say that resolving the issue is of little importance to users. Many analysts are not sure that standardizing on a single version of UNIX is even necessary if the look and feel of the application is the same regardless which operating system is running, says Junichi Saeki, information system group research manager for Dataquest Japan. He adds that he expects the overall UNIX market to grow more rapidly after 1991, as more compact workstations come onto the market and increased demand for networking capability pushes MS-DOS out of the picture.

NEC Owns the PC Market

For now, NEC continues to dominate the PC market with strong sales of its 16-bit PC-9800 and its 32-bit PC, thanks to its huge array of supporting software. In an attempt to counter NEC's dominance of the PC market, 10 companies joined forces last year to develop their own Japanese-language software for 32-bit machines.

It is no coincidence that these 10 vendors are cooperating since more than 50,000 workstations were sold in Japan in 1989, compared with approximately 100,000 units sold over the previous four or five years. Financial, manufacturing and engineering firms are using them on an ever-increasing basis as their prices decline, the quality of their graphics increases and Japanese-language models become available.

Matsushita Electric Industrial Co. Ltd., which reentered the PC and workstation market last year after leaving in 1987, is one company that expects the workstation sector to grow up until the mid-1990s. So is Sony, which has placed high hopes on its NEWS series, despite suffering a setback when sales of its PopNEWS model were lower than anticipated because of a lack of appropriate software.

Desktop Revolution

Analysts say further improvements in workstation screen resolution finally could bring the desktop-publishing revolution to Japan. "There is a huge market," says Dataquest's Saeki. "Around Tokyo there are 50,000 small printing companies." Such companies still generally use old-fashioned metal type, which makes printing with the myriad of Japanese characters a daunting task.

As PCs continue to be upgraded and workstations become cheaper and easier to use, maintaining a distinction between the two groups is becoming irrelevant in Japan as elsewhere in the world, analysts say. Top officials at Japanese computer firms, according to a recent *Nikkei Computer* magazine survey, see the market eventually splitting into two main groups of machines: high-performance mainframes controlling expanded networks and database systems, and a group of machines that could be termed "advanced personal computers."

> ☐ **THE TRADE PACT COULD MEAN MORE COMPETITION IN SUPERCOMPUTERS.**

Fujitsu's bold attempt in 1989 to introduce one such advanced PC, the 32-bit FM Towns, met with mixed success. Aiming at both the home and business markets, the firm wound up making a hit with neither, largely due to the lack of appropriate software. The computer's price—about $2,600—was well out of the standard home PC range. But the FM Towns' main selling point—its use of software based on compact disc read only memory (CD-ROM) technology—gives it good graphics and huge data storage capabilities. Sales have picked up since its lackluster 1989 launch, as more software has become available.

Making the Japanese market available to non-Japanese supercomputers was one main objective of the recent successful round of trade talks between the U.S and Japan. The market-liberalizing Super 301 agreement concluded in March is supposed to help foreign computer makers by prohibiting what amounts to dumping by Japanese manufacturers, which had been selling supercomputers at very high discounts to Japanese public institutions.

What's Hot in Japan

Top Japanese PC suppliers

	COMPANY	PC REV	TOTAL IS REV
1	NEC	3,116.5	11,480.4
2	Toshiba	1,340.8	4,595.1
3	Fujitsu	869.7	12,160.4
4	Hitachi	652.3	8,719.0
5	Seiko Epson	579.8	1,449.5

Top Japanese service suppliers

	COMPANY	SERVICE REV	TOTAL IS REV
1	NTT	898.7	2,254.0
2	NEC	289.9	11,480.4
3	Fujitsu	253.7	12,160.4
4	Hitachi	181.2	8,719.0
5	C. Itoh	108.7	1,345.9

Revenue figures are in millions of dollars.

Hitachi's Main Moves

On the mainframe front, Hitachi made moves seemingly aimed at IBM. Hitachi claims its M-800 Processor Group, introduced this spring, is now the world's fastest mainframe, at 155 million instructions per second (MIPS). Analysts believe Hitachi is serious about trying to increase its market share in the United States, where it now has about 7% of the IBM-compatible mainframe market. Many also see it as a challenge to IBM, whose lead Hitachi has followed until now.

Some industry sources expect mainframe-processing speeds to improve to the range of 200 to 400 MIPS during the 1990s. Future generations of mainframes also could sport great improvements in parallel processing, if the government has its way. In a report issued earlier this year on its Fifth Generation project, the Japanese government discussed the possibility of developing computers with millions of parallel processors.

Building systems that can cope with such new technologies is part of the reason systems integration will be important in Japan through the coming decade.

To meet this need, Japanese systems vendors are steadily placing more emphasis on software, an area in which they traditionally have been weak. Companies such as NTT Data, Japan's leading systems integration specialist, are setting up their own software development subsidiaries. One estimate is that software and related services will account for 50% of all IS sales in Japan by the end of the decade.

Dataquest's Saeki says it will take a few years for Japanese systems suppliers to refine their systems integration skills. Even NTT Data, for instance, still has a long way to go, says Saeki. "NTT Data doesn't have enough experience to be a true systems integrator at present," he says. "But the potential is there. They are in a good position to be the first systems integrator in Japan, but they need at least two years in which to get the necessary experience." NTT's strength, Saeki adds, is its large pool of talented employees, solid capital base and many government and private sector contracts.

Suppliers Take the Plunge

Other observers expect more systems suppliers to plunge into the SI market by forming consortia with companies in specific industries. Their hope is to offer large-scale SI services designed to solve interrelated office or factory information problems in a centralized way. The need to solve those problems is also expected to increase demand in the '90s for broadband Integrated Services Digital Networks (ISDN); fiber optic-based local area networks with transmission speeds of several gigabits per second; and ISDN-like networks supporting simultaneous transmission of images, voice and data.

The pervasiveness of advanced communications and the proliferation of PCs and workstations in Japan should ensure that growth in the IS industry does not cool down. Indeed, the authoritative *Nikkei Computer* magazine predicts a rate of 12 to 13% overall annual growth until the middle of the decade. That growth, however, depends on the ability of Japanese companies to keep making hardware innovations while improving their expertise in fast-growing fields like systems integration and software. ▭

Steve McClure is a freelance writer based in Tokyo.

Economic Weakness Takes Its Toll on IS

Take one part competition, another part world economic slowdown and the result is a potion that has given many an IS vendor sleepless nights while IS execs sleep like babes.

MADELINE FRANCHI

What may be giving suppliers of information technology a case of insomnia is helping many IS executives sleep better at night.

After the intoxication of double-digit growth in much of the 1980s, IS vendors the world over woke up at the end of the decade with something of a hangover, staring glumly at the prospect of less than 6% growth.

But this decline in revenues does not really represent a drop in user demand for computing. Rather, it carries evidence of a trend already familiar to and welcomed by IS execs: increasingly greater performance for less money.

Figures from the DATAMATION 100 (June 15, 1990) show that data-processing revenues from the top 100 companies worldwide rose just 5.5% in 1989, after double-digit gains in the prior four years.

Figures from the Commerce Department confirm the DATAMATION 100's evidence of slowing growth for U.S. vendors. U.S. factory shipments of computers and office machinery eked out growth of only 2.9% in 1989, representing the lowest annual gain since the 5.6% decline recorded in 1986.

But slowing sales for U.S. vendors do not translate into a dearth of hardware entering into U.S. businesses. In inflation-adjusted (or constant) dollars, U.S. purchases of computer hardware grew 11% in 1989. And in the first quarter of this year, domestic investment in this equipment rose at an annual rate of 8.2% to reach an annualized, inflation-adjusted total of $134 billion.

Furthermore, a look at purchases in current-dollar terms reveals the increasing bang for the buck that U.S. companies are enjoying. In 1989, U.S. purchases of mainframes, minis, micros and peripherals, when counted in current dollars, advanced just 4.2%—less than half as much as the constant dollar measure. In 1990's first quarter, the annual rate measured an even weaker 3.5%, a relatively low yearly growth by historical standards.

Growth rates in current dollars can only be lower than growth rates in constant dollars over the same time frame if prices are deflating. According to the Commerce Department, the price of computing power has dropped about 43% just from the beginning of 1985 to the first quarter of 1990. So the computer processing that cost $1 five years ago, now costs only 57 cents.

Cahners Economics predicts U.S. companies will increase their purchases of computer hardware and peripherals by only about 3.4% (in current dollars) for all of 1990 but will bounce back and purchase a relatively hefty 8% in 1991.

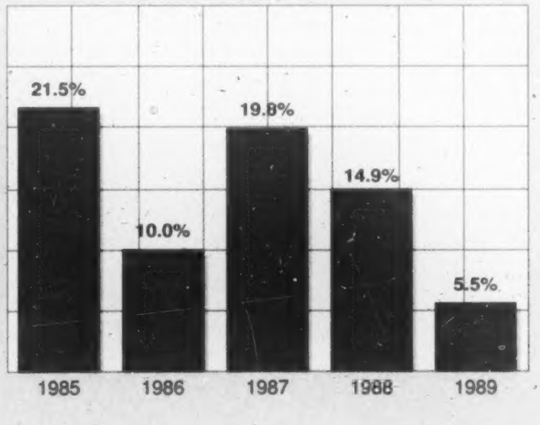
As a share of data-processing revenue of the top 100 user companies, software revenue is on the rise. From 6.3% of IS revenues in 1985, software accounted for 9.6% of the pie in 1989. Similarly, the share of revenue from services has jumped from 6.8% in 1985 to 8.8% last year. Put your money on this upward trend continuing for some time. ▭

For more information on Cahners Economics' forecasting services, including seminars, newsletters and database diskettes, contact Dan Buchan at (617)-558-4758 or (617)-964-3030, or write Cahners Economics, 275 Washington St., Newton, MA 02158.

The IS Market Shrinks...

IS executives don't have to spend as much as they used to for the processing power they need.

WORLDWIDE IS REVENUE GROWTH

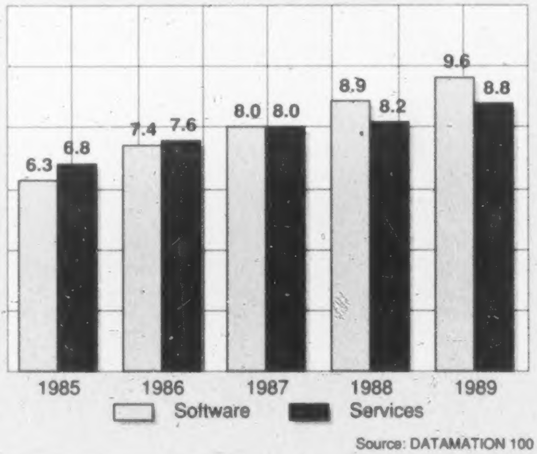


Source: DATAMATION 100

But the Software Slice Grows

Vendors are finding their market is changing from one driven by innovations in hardware to one spurred by solutions based on software and services.

SOFTWARE AND SERVICES REVENUE AS A SHARE OF TOTAL IS REVENUE



Source: DATAMATION 100

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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STANDARDS
STANDARDS

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DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

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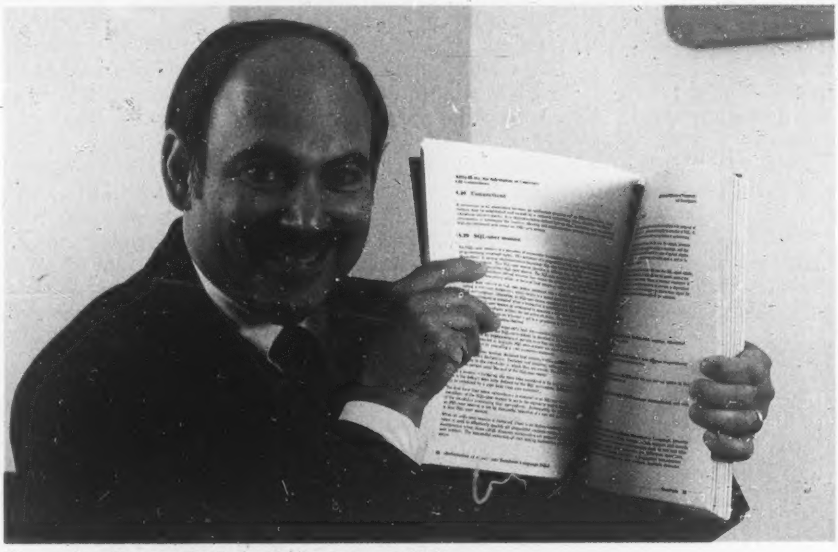

Stamp out the standards confusion in your lifetime.

The Standards Process Breaks Down 24

BY JEFF MOAD X3, the primary U.S. body for computer industry standards, has become overwhelmed and inefficient. Is X3 giving way to more effective standards bodies or is the standards-making process itself getting out of control?

Cover photography by David Bradley

SPECIAL REPORT

Ashton-Tate Gets Back to dBASEics 38

BY JOHN McMULLEN After struggling for nearly two years to deliver a better dBASE IV, Ashton-Tate hopes that the worst of its problems are over. But even if the new version 1.1 performs as advertised, the company faces ongoing threats to its leadership position.

INSIGHTS ON DISTRIBUTED COMPUTING

The more you get into workstations, the more you get into interactive applications and the [need for] shared results between people on a network—and the bigger the problems you get if you don't have a well-defined set of software interface standards.

Daniel Turner
British Petroleum
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Where the rubber hits the road with UNIX is its ability to handle networking.

Mark C. Kustoff
Rhône-Poulenc Rorer Inc.
PAGE 87

We have four elements that we will network together. Our goal is on-line sharing of images and information among all our productions and publications.

Gail Pierson
Christian Science Publishing Society
PAGE 95

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BY BOB FRANCIS Major oil companies have agreed on a common data format for UNIX applications.

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BY CHRIS SIVULA Campbell Soup Co.'s IS lab-tested *everything* before installing its new computer-integrated manufacturing system in the field. The first failure: IBM's OS/2EE.

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BY SCOTT WALLACE To evaluate the effects of high volume image traffic on network performance, we examine medical images on fiber optic networks.

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BY JOSEPH KELLY Sending IS work out can cut costs. However, the price for such benefits may be less control over quality, reliability and strategic direction.

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Why IS Must Be a Partner in CIM 111

BY F.C. (TED) WESTON JR. IS can help link design, manufacturing and marketing to generate the quick responsiveness needed to compete on a global level.

QUALITY ASSURANCE

Balancing Productivity and Quality 117

BY DONALD DARST Many IS managers are faced with the often conflicting demands of increasing productivity while maintaining quality. But the right steps in assuring quality can lead to heightened productivity.

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BY KRIS HERBST Recent trade negotiations with the United States may already be influencing Japanese users and creating a more open, competitive Japanese supercomputer market.

Cray's Hori sees prospects for selling to the public sector improving.

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BY ENRIQUE SAN JUAN IBM's new center in Seville is devoted to natural language processing.

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INSIDE DATAMATION

Setting Standards in the '90s

As surely as personal computers distinguished the '80s, minicomputers the '70s and mainframes the '60s, so too will the '90s be marked by a recognizable advance in information technology. Less certain is whether progress in this decade will be identified with a technology or with something else—something, perhaps, having much greater impact than any combination of chips, software and networks could achieve.

That something could well be standards. The term—although applied most often in reference to operating systems, communications, interfaces and the like—really embraces much more than components of information technology. Whether they take the form of UNIX, OSI or GUIs, standards mean freedom for users. Standards, when they exist, allow users to choose the building blocks of their applications with confidence that those blocks will fit with the others in their applications—now and in the future.

PUTTING BACK THE PIECES of standards confusion.

Trouble is, the formal standards process—at least in the United States—isn't working very well. The problem, as senior writer Jeff Moad finds in "The Standards Process Breaks Down," p. 24, is fairly simple to see: the committees that promulgate standards aren't market driven. Users, the people who ultimately foot the bill for standards, don't have much say in the process. And time, the factor against which most suppliers and users really compete, doesn't seem to be a big concern for most formal standards-setting bodies.

Too much is at stake, of course, for the process to stay this way. Suppliers and users alike are forming consortia of all kinds to create new standards—quickly. The Corporation for Open Systems, the Open Software Foundation and X/Open Co. Ltd., some of the better known groups, are already having an influence on products coming to market. Less visible, but perhaps of greater importance, are the groups of industry-specific users and software developers that have banded together to speed agreement on technologies crucial to their business success.

Striking Oil With Standards

DATAMATION Dallas bureau manager Bob Francis, who a year ago chronicled the efforts of Detroit's big auto makers and a dozen other *Fortune* 500 industrial companies to forge a standard for the exchange of product data, has found another user-driven standards endeavor that is closer to home. In "Oil Firms Seek UNIX Standards," p. 63, Francis reveals why the world's leading oil producers expect to strike it rich if they can adopt a standard for using workstations in their exploration applications.

Such users must be a larger factor in standards-setting efforts, but the fact is that suppliers will continue to wield significant influence. Their strength is no more evident than in relational database technology. Even a supplier that has lost its luster, as associate editor John McMullen finds in "Ashton-Tate Gets Back to dBASEics," still holds power over users that have invested millions in creating applications atop its RDMS.

Tim Mead

Tim Mead, Editor-in-Chief

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What's Cookin' in Campbell's CIM Lab

Forget field testing—lab testing is faster and safer. Campbell Soup Co.'s IS lab-tested *everything* before installing its new computer-integrated manufacturing system in the field. The first failure: IBM's OS/2EE.

BY CHRIS SIVULA

Nobody would argue with Campbell Soup Co.'s 10-year plan to use information systems to cut costs, reduce inventory and improve quality. "It's all motherhood and apple pie," says Alan Carr, director of manufacturing systems.

But getting agreement from the Camden, N.J.-based company's 39 worldwide IS departments about how to reach those goals is another matter altogether. Four years into a major overhaul and centralization of its computer-integrated manufacturing (CIM) process, Campbell has come to depend more and more on its corporate IS test lab to help build support in the field for the new factory automation project and to accelerate the installation process for a centralized CIM management system. By aggressively using the test lab, Campbell's IS management hopes to finish the project within the next two years—four years ahead of the original plan.

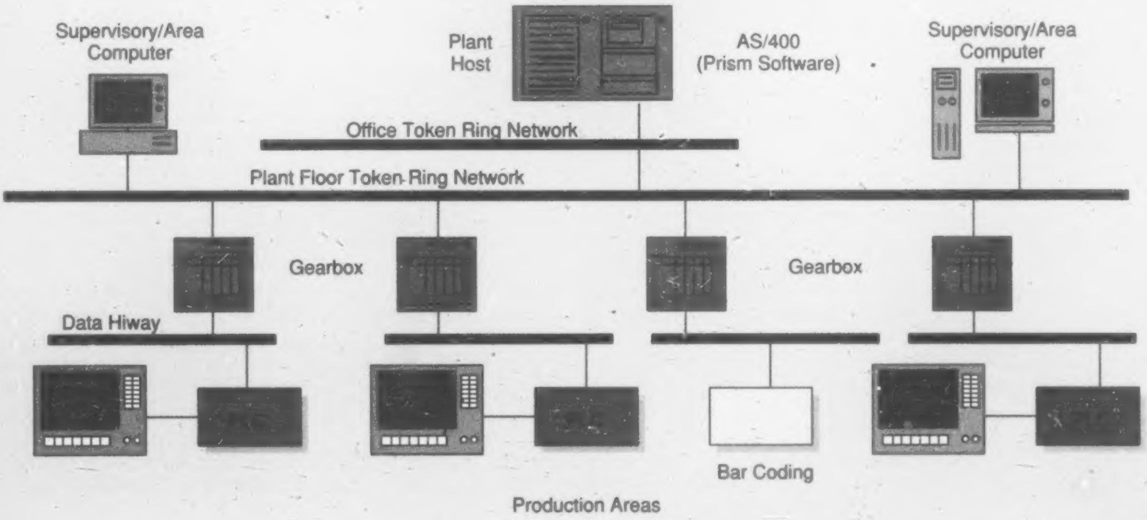
The project is ambitious. The CIM group at Campbell's information systems department is working to develop an integrated system that will link higher level financial management applications at corporate headquarters to the factory-level financial systems (including purchasing, receiving, inventories, bill payment and payroll processing) at all 39 plant sites. It will also link financial systems to the systems that control the automation process on the factory floor.

Campbell, established in 1869, generated $5.7 billion in sales last year with 55,000 employees worldwide. Besides the familiar red-and-white canned soup, the company makes Prego spaghetti sauce, Vlasic pickles, Mrs. Paul's fish sticks and Pepperidge Farm breads. Bringing together the production and financial management systems for such di-

What's Cooking in Campbell's CIM Test Lab?

IS set up this working model of a typical Campbell Soup plant's CIM systems and software at the company's Camden, N.J., headquarters.

CAMBELL SOUP'S CIM ARCHITECTURE


Supervisory/Area Computer
Plant Host
AS/400 (Prism Software)
Supervisory/Area Computer
Office Token Ring Network
Plant Floor Token Ring Network
Gearbox
Gearbox
Data Hiway
Bar Coding
Production Areas

verse and widely scattered operations into an integrated system is no easy task.

All nine of Campbell's U.S. plants have brought up CIM factory automation systems. But the central financial management system planned for Campbell's corporate headquarters has stalled.

To smooth the transition to a fully automated, corporatewide CIM/financial management system, Campbell's CIM project managers are using a model factory at the company's headquarters in Camden to serve as a test lab for the new systems. The CIM lab houses a duplicate version of the standardized system that the plants are adopting and is the locus for changes in IS and CIM systems at all Campbell Soup plants. It includes a network of 10 PS/2s and an IBM AS/400 midrange computer to duplicate the onsite plant systems and processes down to the level of the logic controllers on the plant floor, says Michael Cola, Campbell's project manager for CIM.

Bug-Free Soup Kitchens

For the most part, developers at the lab use software to simulate factory conditions. But occasionally they modify the test system to duplicate actual production processes. Cola brought in automated scales to measure ingredients for Campbell's products during one test project, for example. And the group isn't afraid to use creative substitution, either; recently, the CIM lab's IS staff rigged up a turntable device to pass cans under a sensor during development of a product-counting system.

Corporate IS at Campbell recently launched a formal effort to speed development of new applications, and the CIM lab is a key part of that effort. Virtually all new software and in-house redesigns of existing systems are tested first in the lab in order to avoid the nightmare of bringing up new and untried systems on site at operating plants. Testing new systems in the lab first also helps decrease time to market, since simulations of new production processes can stamp out most bugs before they show up in the soup kitchens at Campbell's plant sites.

Automation: Not Soup Yet

Systems management staff at Campbell Soup Co. entered uncharted territory when they set about automating all of the company's plant sites around the world, then tying these sites directly to Campbell's corporate headquarters. It's never been done before, and they had no models to follow.

In fact, the process industry still has a long way to go to automate production. Discrete manufacturing—electronics, autos, aircraft and the like—has generally taken the lead in automating production. Process manufacturing—prepared foods, pharmaceuticals and chemicals—has had problems translating the analog world of mixing and melding into the digital world of automated-manufacturing technology. And in both types of manufacturing, integrating the management of several plant sites into corporate headquarters stretches the boundaries of traditional IS functions.

To help develop systems that push past those boundaries, Campbell has joined a consortium that includes IBM, SmithKline & French Laboratories International, Nestle Food Corp., Johnson & Johnson and Ralston Purina Co. The consortium's project, called Process Operations Management System (POMS), is designed to provide code needed to seamlessly link the factory floor with corporate management.

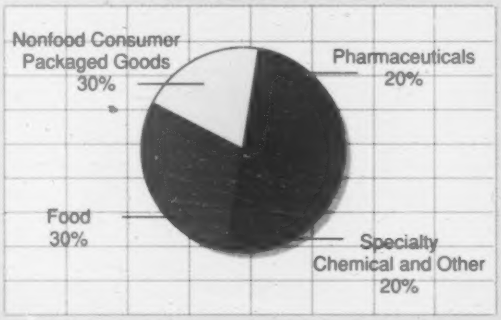
In 1988, the consortium launched the Industrial Computing Designs Corp., or INCODE, of Reston, Va., specifically to develop an operating version of POMS. Under the consortium's agreement, INCODE owns the software, and IBM maintains marketing rights. In exchange for their participation, the five process manufacturers receive an enterprisewide license to use the software.

Last summer, Campbell's IS management was high on the project. Because the software is designed for the PS/2 and AS/400 systems—both already installed in nine of Campbell's plants—the food manufacturer expected a quick roll-out once POMS was shipped. But POMS was delayed for six months, and then Campbell's test lab discovered a bug in OS/2EE version 1.2, the operating system required for its implementation of POMS. As a result, the company has backed off from its plan for a quick test and fast implementation. But despite the late release and subsequent problems with OS/2, INCODE pushed ahead and released a developers' version of POMS early this year written to work with the older version of OS/2; INCODE subsequently released a final version of POMS in June.

Needed Badly: A Process Operations Management System

For 50,000 process industries worldwide, CIM is still science fiction. Can POMS make it real? Campbell's Soup has its doubts.

POMS CUSTOMERS



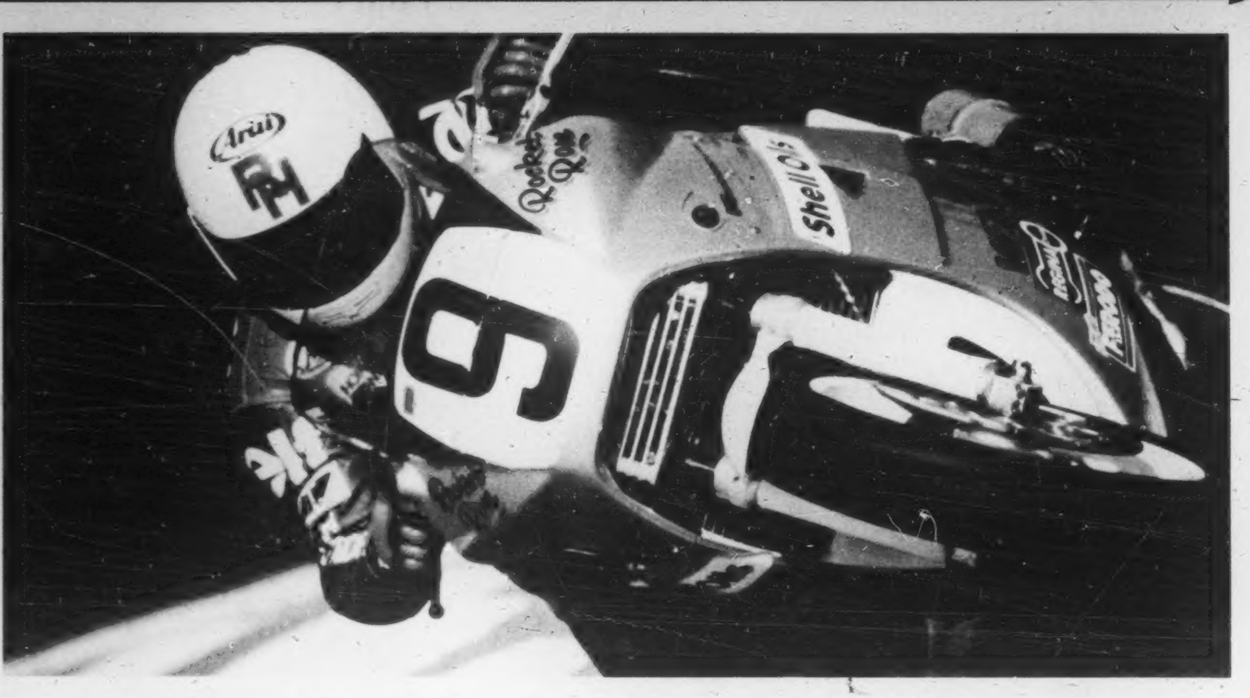
Total POMS market: 50,000 installations
U.S. share: 17,000 installations

Source: Advanced Manufacturing Research

The developers' version of POMS wasn't of much use to Campbell, says Michael T. Moylett, system analyst for the CIM group in Camden. Developers there could use it to design some screen displays but not to build the integrated applications—production schedules, formulas, inventory tracking, product counts and downtime analyses—that require networking capabilities not available on the early release, Moylett says.

So, now there is no set schedule for POMS implementation at Campbell. The software is still being extensively tested at the CIM lab in Camden, and there is some question as to whether it will ever be installed in the field. MIS management is now considering alternative solutions to the problem of centralized CIM management, Moylett says. Even if the extensive testing reveals no more bugs and Moylett can solve some apparent incompatibilities between Campbell's management systems and POMS, the CIM group in Camden is still not sure that IS management at Campbell's production plants will accept POMS.

Adds Moylett: "If people don't agree to run it, then it doesn't matter if it's the best stuff in the world."



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Circle 25 on Reader Card

But the lab is likely to play one of its most important roles at Campbell by helping to convince plant managers and regional IS executives to become more willing participants in the company's plans to integrate and standardize CIM applications, Cola says. The lab's contribution in those areas is simple, but crucial. An already skeptical plant manager, responsible for maintaining production schedules, won't be won over by a new application that crashes and brings manufacturing to a halt. But by using lab tests to refine installation procedures and clear away bugs in advance, Cola hopes to convince the skeptics that the downtime required to bring up new systems will be minimal.

OS/2 Fails the Test

When IBM shipped OS/2 Extended Edition version 1.2 to Campbell in June, the lab proved it could prevent that sort of disaster with the installation of OS/2. Just one week before the new version of OS/2 was scheduled for installation at the company's Sacramento, Calif., plant, Cola gave it a test run at the lab. The results: "It basically clobbered the network management software," he says.

☐ OS/2EE BASICALLY CLOBBERED THE NETWORK MANAGEMENT SOFTWARE.

The off-the-shelf version of OS/2 that IBM shipped contained a bug most users might never have noticed. But Campbell's system pushed OS/2 further than IBM's tests had. "IBM hadn't stretched the envelope as far as we did," explains Michael T. Moylett, system analyst for the CIM group at Campbell. Cola had to postpone further tests for two weeks to wait for a fix from IBM. That's the kind of experience that makes him shudder at the thought of taking untested software directly out to a manufacturing plant, he says.

By testing first and asking questions later, Campbell's IS management has successfully avoided many of the potential problems associated with the installation of new systems. At each of the company's nine U.S. plants, an IBM AS/400 serves as the host computer and a Token Ring network links a series of PS/2s running OS/2 Extended Edition to the host. Prism, a production resource planning package from Marcam Corp. of Newton, Mass., resides on the AS/400. The manufacturing control software is ONSPEC, from Heuristics Inc. of Sacramento. In addition to all nine of Campbell's U.S.-based food-processing plants, which have switched over to a standardized CIM system in the last four years, Campbell owns 30 offshore plants that are still in the process of converting.

The next step for the U.S. plant sites is to tie into a centralized integrated management system at Campbell's Camden headquarters, says Moylett. In an attempt to do so, Campbell has entered into a partnership with four other process-manufacturing firms, IBM and the Industrial Computing Designs Corp. (INCODE) in Reston, Va., to develop a centralized process industry management system called POMS (for Process Operations Management System). However, Campbell's management is taking a go-slow attitude towards POMS and doesn't expect to have a system installed for at least another two years, says Moylett, if that. They plan to test the system further at the CIM lab and build stronger support among plant site IS staff, as well.

IS staffers at the off-shore plants fear the new centralized system could mean reduced autonomy for regional and departmental IS personnel. The trick for Campbell, says Rob Cohen, director of development services for corporate MIS, is to create the disciplined approach to centralization that will allow integration of the various plant systems but still leave on-site IS officials the measure of independence they need to develop creative solutions to problems unique to individual plants.

Support from the regional IS staff isn't the only problem: the new centralized integrated system also requires that plant engineers work much more closely with IS than they have in the past. Such a marriage is not without its problems. One way that Campbell is trying to make the union between IS and engineering reasonably smooth, if not blissful, is by hiring Carr, an engineer, away from the R&D shop to manage the CIM project. In the U.S. plants, at least, that seems to have been a good move. Carr says: "There was some confrontation for a while, but we've managed to build a consensus."

CIM Links IS and Engineering

CAMBELL SOUP'S COHEN (L), AND CARR: It's all motherhood and apple pie, Carr says.

If you're having problems getting support in the field for bringing up a companywide computer-integrated manufacturing system, be sure you've got strong support from the top—then crow about it. "Having champions at high levels is critical," says Rob Cohen, Campbell Soup Co.'s director of MIS development services.

With top management in their corner, IS and engineering at Campbell were able to develop a formal structure to settle the political problems that inevitably develop when the lines between departmental turfs begin to blur, Cohen says.

For starters, when IS execs decided to create a CIM position four years ago, they found their final candidate right in the engineering department: Alan Carr. Carr was recruited from engineering's research and development division, where he was working on plant control systems.

"The feeling was that MIS had little experience in engineering and plant floor systems," says Carr. By picking Carr, IS not only picked up engineering expertise, it also obtained a direct link to the engineering department.

Carr reinforces the link by talking almost daily with his counterparts in engineering. Other formal ties between the two departments include regular meetings between engineering, operations and IS to hammer out technical details and periodic, although less frequent, meetings between the vice presidents of IS and engineering to develop joint policy statements regarding the company's move to CIM.

A More Open Market For Supercomputers

Recent trade negotiations with the United States may already be influencing Japanese users and creating a more open, competitive Japanese supercomputer market, particularly in the public sector.

BY KRIS HERBST

Since the U.S.-Japanese trade negotiations were concluded this spring with the Super 301 pact, there has been near universal assent that the agreement has resolved U.S. complaints about trade barriers blocking access to the Japanese supercomputer market.

Indeed, increased business inquiries from the public sector are an indication that the agreement seems to have alleviated the main point of contention: lack of access by U.S. companies to the business of the Japanese government and universities.

Yoshikazu Hori, president of Cray Research Japan Ltd., says the trade agreement has abolished the market barriers, giving Cray, for one, equal access to the Japanese supercomputer market. "I appreciate very much what has been done from both sides—the U.S. government and the Japanese government," he says. "The situation has been improved; out of those tough negotiations, I think Cray's market share will grow."

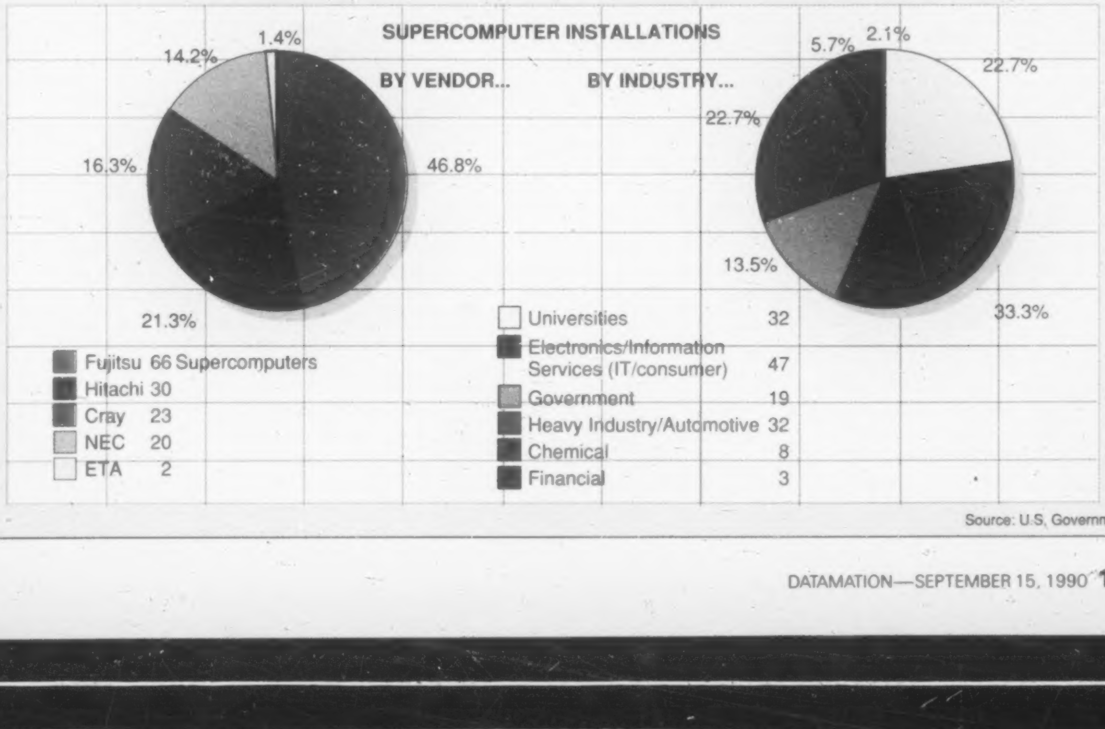
Now that the formal barriers have been negotiated away, U.S. supercomputer makers can concentrate on battling other, less obvious market barriers. One is the impressions, held by many chief executives in Japan, that Japanese technology is superior to U.S. technology and that Japanese companies are less likely to discontinue product lines or go out of business, says Cray's Hori. "The market is growing and we have a lot of opportunity, but competition is always so intense," he says.

Everyone Gets a Piece of the Action

That competition is unlikely to let up. Manufacturers on both sides of the Pacific predict that growth in the Japanese supercomputer market will allow everyone to get a piece of the action. Supercomputer sales in Japan totaled 30 units in 1989 and will grow at a rate of slightly more than 15% annually, reaching 64

The Shape of Japan's Super World

Unofficial figures compiled by a U.S. government agency show Fujitsu with nearly half of the approximately 141 supercomputers installed in Japan to date. The electronics industry, both computer and consumer, leads in the use of supercomputers with one third, followed by heavy industry/automotive with 22.7%.



Source: U.S. Government

CRAY'S HORI: Cray's prospects for selling to the public sector have improved along with its batting average.

units in 1994, according to Junichi Saeki, research manager for the information systems group of Dataquest Japan Ltd. in Tokyo.

"The market is really booming," confirms Raul Mendez, director of Recruit Co. Ltd.'s Institute for Supercomputing Research, also in Tokyo, which uses both Japanese and U.S. supercomputers. The institute has two Crays—an X-MP/216 and X-MP/18—as well as a Fujitsu VP400 and an NEC SX-2A.

Mendez points out that 65% of the supercomputers in Japan have been purchased by users in private industry, in contrast to the situation in the United States, where the majority of the supercomputers are installed in government agencies, universities and academic research institutes. "The industrial sector is one of the biggest users of supercomputers in Japan, bigger than the defense sector or universities, and Japanese industry and the economy is booming," Mendez says.

Figures vary as to the actual number of supercomputers installed in Japan. But no matter who does the counting, Fujitsu Ltd. dominates the total Japanese supercomputer market. Dataquest Japan puts Fujitsu's total at 56 supercomputer installations, giving it a little more than a 51% share of the market. Unofficial figures from the U.S. government put the total at 66. Either way, "Fujitsu is very strong in marketing," Mendez says. "They hold the largest share of large-scale computer systems, including mainframes. As a consequence of that [large market share], they provide very good support, and that gets translated into a large share of the supercomputer market." The Dataquest figures show both Cray Research Japan and Hitachi Ltd. with 18 installations, or about 17% of the market each, followed by NEC Corp., which has 16 installations, giving it a 15% share. The U.S. figures put Cray in second place with 23 computers representing a 16% share. NEC, with 20, accounts for about 14% of the market (see chart, "The Shape of Japan's Super World").

Cray itself offers figures for market share by type of machine, saying that it commands a 53% share of the market for high-end supercomputers. Until now, it has not attempted to compete in the Japanese market for low-end machines, or minisupercomputers, although it is now preparing to introduce a low-priced air-cooled supercomputer.

The public market for supercomputers is only half the size of the private market in Japan. But it is an important one for Cray because "the public sector market is always requiring top-end machines; it's a big market for the big machines," Hori says. He adds that other benefits from public sector sales include joint development of new software applications with universities and the creation of a pool of engineers who become loyal to a particular machine in college and can influence their employers' purchasing decisions when they move into the private sector.

Until now, neither Cray nor any other U.S. supercomputer firm has had much success in penetrating the public market. The U.S. Embassy in Japan says that U.S. firms hold less than 6% of the public sector supercomputer market, which includes Japan's universities.

But when it comes to private industry, particularly Japan's automakers, Cray has an advantage over its competitors. The Japanese supercomputer industry lags years behind the United States in developing software applications and operating systems, so Japanese manufacturers must rely on U.S. supercomputers such as Crays to accelerate their design cycle times and keep them competitive.

> ☐ **U.S. FIRMS HOLD LESS THAN 6% OF THE PUBLIC SECTOR SUPERCOMPUTER MARKET.**

Cray Fishing

A Cray supercomputer can be found at Daihatsu Motor Co. Ltd., at Honda Motor Co. Ltd., at Mazda Motor Corp. and at Mitsubishi Motors Corp. Nissan Motor Co. Ltd. and Toyota Motor Corp. each have two. Hori adds that he has focused mainly on the automotive industry since he was hired by Cray in 1987. Analyst Mendez says, "I see a lot of demand within the automobile industry. Practically all automakers in Japan are using Cray supercomputers because they have very good software applications for crash analysis and various other simulations."

The lack of software is hindering Japanese supercomputer makers from marketing their wares outside Japan, according to Mendez. "The lead that Cray has in that area is quite significant," he says. "It's going to be a while before that gap can be overtaken."

In an attempt to close the software gap, Japanese supercomputer manufacturers are setting up software-porting centers in Japan and the United States. "NEC is now making very strong efforts to port application packages by using our software porting center here in Tokyo and the sys-

Japanese Architecture's Prime Example

NEC Corp.'s latest supercomputer, the SX-3 series (known as the SX-X in the United States), is the ultimate expression of Japan's multiple pipeline approach to supercomputer architecture.

The series sets a new standard for multiple pipeline architecture, using eight add pipelines and eight multiply pipes that function independently, serving 16 vector-function units in each of up to four processors. This is about double the number of pipes used in the current generation of Japanese supercomputers. Shipments of the SX-3 series were scheduled to begin in August or September, says Tadashi Watanabe, assistant general manager of NEC's EDP product-planning division.

The architecture will make the top-of-the-line machine in NEC's SX-3 series, by far, the world's fastest supercomputer, with a peak performance rate of 22 billion floating point operations per second (GFLOPS), according to NEC. Japanese multi-pipeline supercomputers like the SX-3 allow fast peak operating speeds when used for certain types of computational problems that are characterized by long vector lengths, on the order of 2,000 to 3,000 words, and a high ratio of vector to scalar computations. Examples of these kinds of computations include certain fluid dynamics problems and geographical model simulations such as seismic exploration or weather forecasting.

tems we have installed at the Houston Area Research Center (HARC)," says Tadashi Watanabe, assistant general manager of NEC's EDP product-planning division.

UNIX: the Next Generation

Japan's Big Three supercomputer vendors, Fujitsu, Hitachi and NEC, have all announced plans to include the UNIX operating system with their next generation of supercomputers, which should improve software portability. These computers will also incorporate the Transmission Control Protocol/Internet Protocol (TCP/IP) networking standard, which should advance connectivity among disparate systems.

In supercomputer hardware, Japan is posing a vigorous challenge to U.S. technology. Since the first-generation Japanese supercomputers appeared in 1983, Japanese manufacturers have used a CPU architecture that relies on multiple pipelines in a single processor to maximize peak operating speeds. In contrast, Cray computers have incorporated multiple processors and have consistently used only one addition pipeline and one multiplication pipeline per CPU.

☐ PRACTICALLY ALL AUTOMAKERS IN JAPAN ARE USING CRAY SUPERCOMPUTERS.

The multiple pipeline approach has allowed Japanese supercomputer makers to achieve fast peak performance on benchmark tests characterized by long vector lengths. For intermediate vector length problems, however, the overhead time that multipipeline machines require to move data back and forth from the memory can drastically reduce actual sustained performance speeds. Because of this limitation, the current generation of Japanese supercomputers has been matched or exceeded by the Cray Y-MP8 in other benchmark tests.

Some industry observers maintain that the practical limits of multiple pipeline architecture will be reached with NEC's newest SX-3 series, which is scheduled for an August or September release. At this point, they say, adding more pipelines could yield diminishing returns in boosting operating speeds.

It now appears that the U.S. and Japanese approaches are converging, says Mendez. The SX-3 series marks the first time a Japanese supercomputer manufacturer has used multiple processors in a single supercomputer. At the same time, Cray is expected to use more pipelines in its future models.

Cray is pitting its architecture against NEC's in an attempt to win one of four public contracts that were up for bid this year. The two are vying to provide a multiple-processor supercomputer for the Computational Fluid Dynamics Center at Japan's Tohoku University. Looking for proof that U.S. vendors now have real access to the public sector, both the U.S. government and the U.S. supercomputer industry have been closely monitoring the course of these public-sector contracts.

Cray's Batting Average Improves

Because the university already uses NEC computers, it appeared initially that NEC had the inside track on the Tohoku contract. But a rumor persists that NEC will quietly withdraw from the bidding at the last moment, allowing Cray to win the contract by default. Two explanations exist for the rumor. One is that the withdrawal will be a response to behind-the-scenes pressure from the Japanese government, which is hoping a Cray sale to Tohoku will reduce trade frictions with the United States. Alternatively, NEC may withdraw because of delays in preparing the SX-3 for release [illegible] because the Japanese firm can't meet Tohoku's technical specifications.

NEC has avoided comment on the Tohoku contract, although Watanabe says, "We are now carefully watching their specifications. Whether our system will meet them or not, I can't say at the present time."

Cray's Hori expects to win just one of the four public supercomputer contracts—at Tohoku. Two of the contracts—for the Japan Atomic Energy Research Institute and the National Aerospace Laboratory—have already been awarded to Fujitsu, and Hori says, "I gave up bidding on the Kyoto University contract because Kyoto is entirely a Fujitsu shop." Nevertheless, Hori says, he is satisfied to be batting .250 this year. "At least we have a 25% market share in the public sector," he says, smiling. "In the past, it was almost zero. For the last three years it [the whole market] has been a Fujitsu environment."

And today's reasonably better batting average may be tomorrow's stellar World Series performance. As Hori points out, "We have had quite a few inquiries from the Japan Science and Technology Agency and the Ministry of Education [which is in charge of purchasing supercomputers for Japan's universities], totaling more than $100 million. I don't know if they have been budgeted or not, but such a strong demand for the Cray is very encouraging for us." ▭

Kris Herbst is a Tokyo-based freelance writer specializing in technology topics.

Solving the "Super" Trade Problem

Before the most recent round of U.S.-Japanese trade negotiations commenced, the United States complained repeatedly that Japanese procurement practices prevented U.S. firms from selling supercomputers to public sector buyers.

Notwithstanding the fact that Japanese supercomputer vendors often find the U.S. public sector less than open, the U.S. claim was largely true. In the past, Japanese computer makers have sold supercomputers to Japan's government institutions at enormous discounts, often 80%to 90%. U.S. vendors could not match these discounts, which were virtually locked in by the government's practice of determining its budget for supercomputer purchases based on what it had paid for its previous, heavily discounted machines.

The United States also complained that the mechanics of the government's procurement process were obscure, that selections were made on the basis of a supercomputer's unrealistic theoretical peak, or catalog, performance, rather than on actual sustained performance. Once those minimum specifications were met, supercomputers were picked on the basis of price, rather than on a combination of price plus performance, which weighed heavily against U.S. supercomputers.

The new Super 301 agreement between the United States and Japan should eliminate discounts in the Japanese public sector by providing adequate government funding (although some discounting will still occur in the commercial market). The pact also makes the procurement process more clear to potential vendors, institutes a complaint procedure and requires that a combination of actual performance and price be used as the criterion for awarding procurement contracts.

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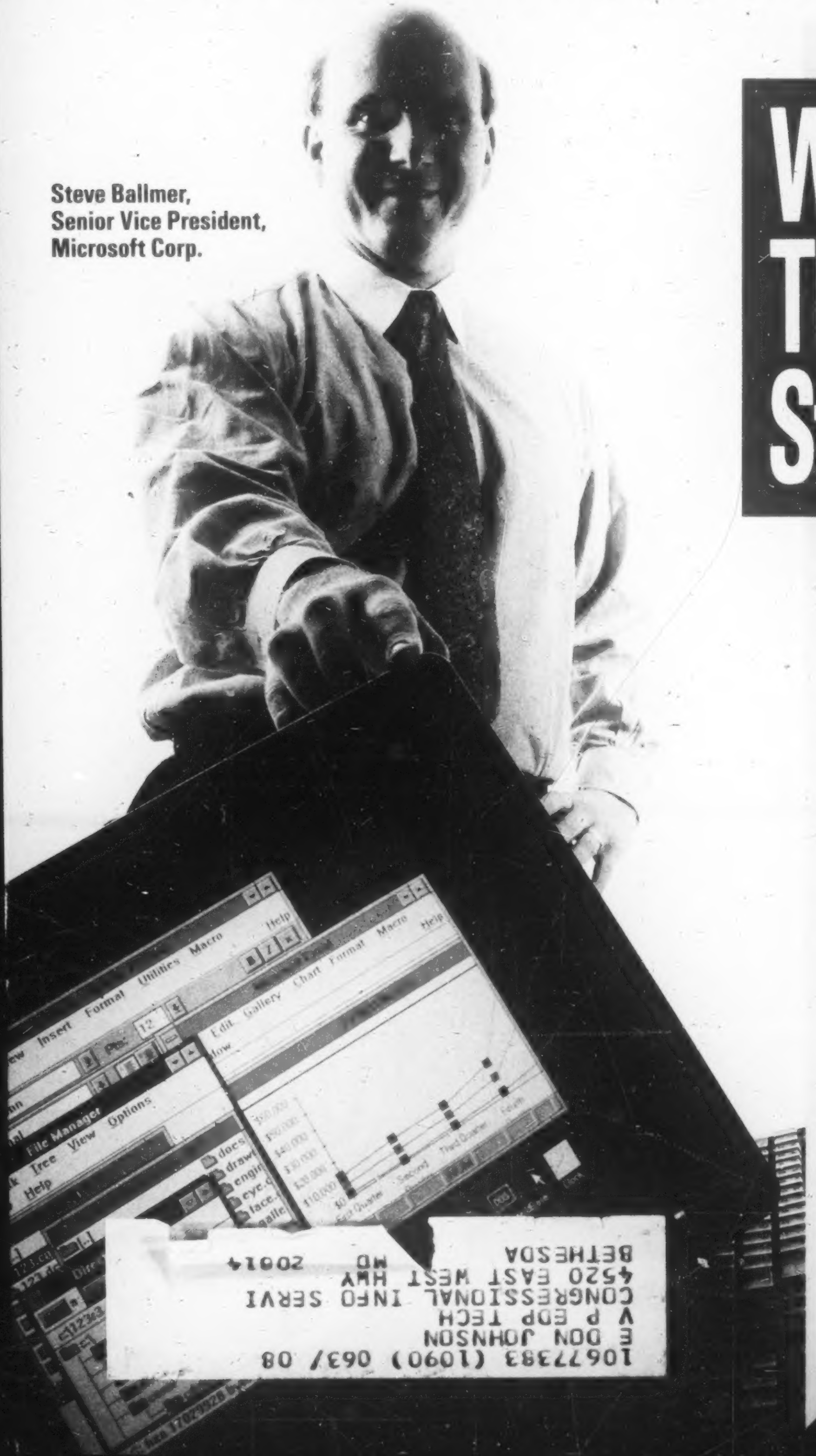
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Steve Ballmer, Senior Vice President, Microsoft Corp.

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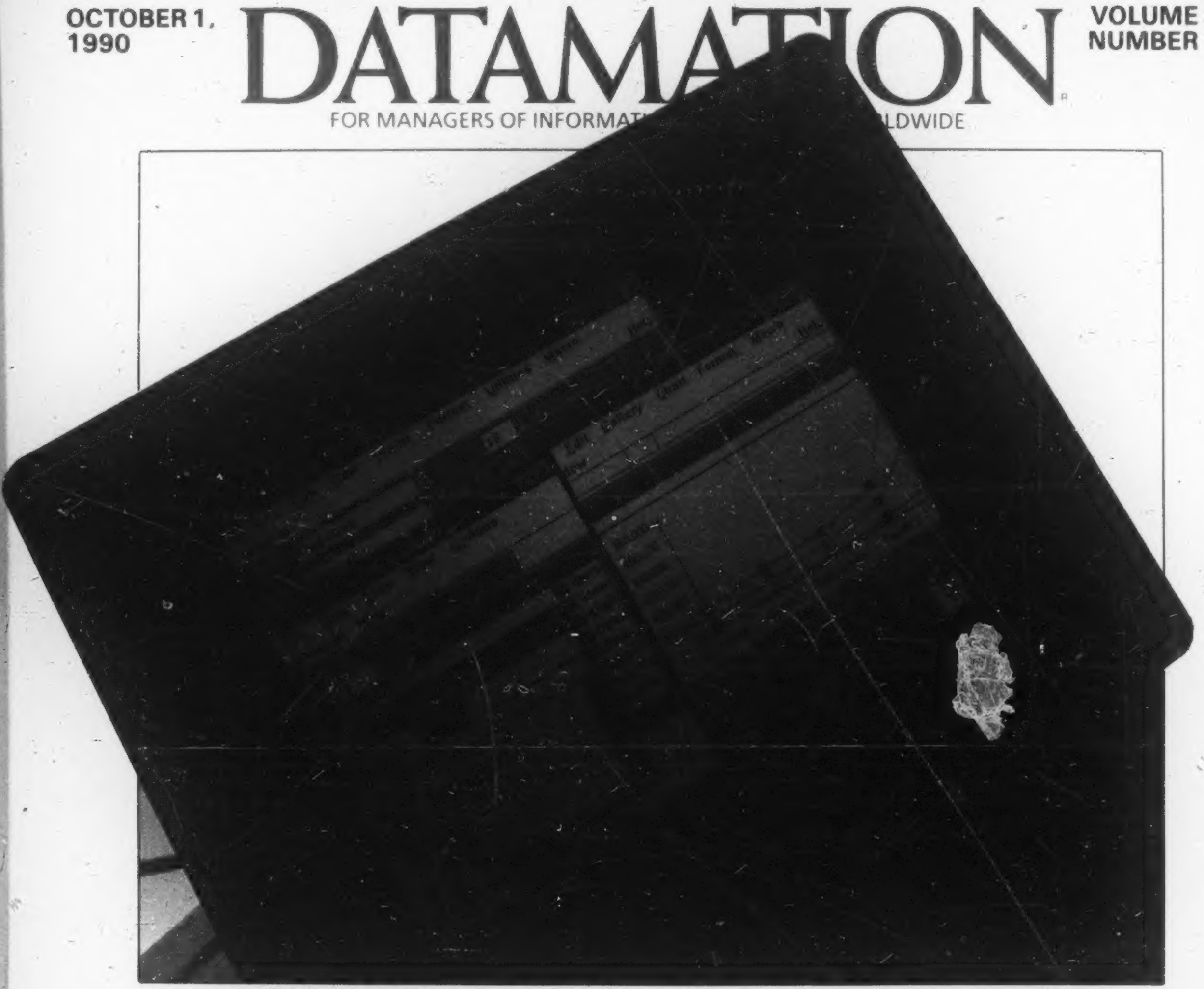

Microsoft's Windows 3.0 draws renewed interest from the IS community.

COVER STORY

Windows 3.0: The Corporate Standard 30

BY JEFF MOAD After five years of trying, Microsoft has scored a corporate hit with Windows 3.0. But with OS/2 slowed to a crawl and DOS suddenly reinvigorated by Windows, IS managers are asking: Where do we go from here?

Cover photography by Dale DeGabriel

PCs & WORKSTATIONS

SOFTWARE PRICING

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BY JOHN McMULLEN A lack of consistency among PC software suppliers threatens to undermine the explosive growth of local area networks. No two licensing options are alike, and customers feel bogged down by the fine print.

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BY MIKE RICCIUTI Sun Microsystems hopes that its SPARCstation SLC will become a champion in business markets.

Sun's Nicastro with SPARCstation SLC

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BY JOHN McMULLEN PC users and developers up against the MS-DOS 640KB memory wall have often wished for a powerful DOS. Thanks to DOS extenders, now they have a way to supercharge their applications without migrating to OS/2.

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BY EMILY LEINFUSS With DEC/EDI, VAX users can optimize hardware use and add applications and trading partners to their electronic data interchange system without having to write new code.

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BY SCOTT WALLACE With flexible configuration, the Synchronous Optical Network standard will let users tailor transmissions to the bandwidth they need and develop innovative services such as video conferencing.

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BY DAVID STAMPS So what if many early users of DB2 couldn't find their own grandmothers in the NYC phone directory? DB2's still selling like hotcakes. And a whole new software support industry is rising up to help you keep up.

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Software AG Leaps Into Server Systems 99

BY RALPH CARLYLE What have the doyens from Darmstadt been up to of late? Something great, they say. For starters, Software AG is readying an ENTIRE new client/server system—a first for the company.

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The New Power of the HP LaserJet III 103

BY ALAN BRODY Hewlett-Packard has beefed up its LaserJet printer with features like font scaling and resolution enhancement. Now HP is giving competitors selling PostScript-based printers a run for their money.

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The New DATAMATION

"When all is said and done, what this industry is really all about is the creation of useful products to help people do their jobs."

Sounds like a simple statement, doesn't it? Well, it is. But it's more than that. It's elegant, too. The quotation—from Microsoft Corp. chairman Bill Gates—is elegant because its meaning, and its truth, is self-evident: useful products do help people. Indeed.

The quotation also underscores, and reinforces, our own research. You have told us in studies and in face-to-face interviews that you want more useful information about significant products and technologies that can help you do your jobs better. So, beginning with this issue of DATAMATION, we aim to be more useful by focusing on what's really important to you, the IS manager.

(FIRST TIER L. TO R.) New publisher Mike Wisner with new recruits Schlack, Appleton, Lindsey, Pinella, Semich and N.E. bureau manager Ted Bunker; (2nd tier, l. to r.) Sawyer, veteran Brousell and Ricciuti; (front) art director Chris Lewis.

As you can see from this issue's cover, and from the new departments you will find inside this issue of DATAMATION, we have enhanced the magazine by concentrating our editorial attention on the selection and dissection of the critical products and technologies—and we've done it in the interpretative journalistic style you expect of DATAMATION. Our cover stories will spotlight and put into perspective the best hardware, software and communications products. Our expanded product section, now part of the new Product Guide, not only focuses on new products but also provides you with market and supplier data on entire classes of products.

Further, we have enriched the main feature sections of the magazine. Our new PCs & Workstations section will help you cut through and evaluate the many leading edge offerings in desktop computing. And our new Networks section will assist you in linking systems together.

Pretty impressive, you say? Well, that ain't all folks. We have also heard your concerns about lack of time to read the large number of industry publications serving what seems to be every possible technology niche. So in response, we have created Media Report, a two-page department that will give you a digest of news, research and opinion about the IS industry from other publications.

In addition, to better track the financial performance of the IS industry, we introduce an exclusive market statistic geared specifically to IS. In our Market Insights pages, we will follow this economic measure, DATAMATION's unique Information Systems Performance Indicator, assembled by Cahners Economics. A composite of government statistics, the indicator will give you the big picture of economic trends in IS. At the same time, Cahners's Business Research Group each issue will let you know what emerging technologies your peers are considering.

And now a word about the decentralized organization we have put into place to enable DATAMATION to provide all of this to you. We have devised a management structure staffed with senior editors and teams of writers oriented around specific technologies. Senior editors Paul Pinella, Mark Schlack, Bill Semich and Elaine Appleton are in charge of the PCs & Workstations, Networks, Software and Systems sections of the magazine, respectively, with Appleton also leading our International Edition efforts. Senior editor Bob Sawyer and assistant editor Mike Ricciuti run the Product Guide section. And editorial researcher Sarah Lindsey shepherds Media Report.

As we start our 34th year with this issue, it's a new DATAMATION: better positioned editorially, better structured and better equipped to help you do your job. And isn't that what it's all about?

David R. Brousell, Editor

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The New Power of the HP LaserJet III

Hewlett-Packard has beefed up its LaserJet printer with features like font scaling and resolution enhancement. Now HP is giving competitors selling PostScript-based printers a run for their money.

BY ALAN BRODY

Users aren't likely to buy an HP LaserJet laser printer because of its internal page description language—even Hewlett-Packard Co., its manufacturer, will admit that. In fact, few users have reason to know it exists.

Rob Davis, PC training coordinator for New York City-based Condé Nast Publications Inc., is responsible for the company's 200 HP LaserJets. The only time he even thinks about page description languages, he says, is "if we are doing something specific like graphics, presentations and desktop publishing. Then we have to use PostScript printers." For Condé Nast, that can mean buying printers from companies like Mobile, Ala.-based QMS Inc. or Cupertino, Calif.-based Apple Computer Inc. or adding PostScript cartridges, extra memory and printer ports to its LaserJets.

But with HP's LaserJet III, introduced in February 1990, users are beginning to recognize the HP printer's page description language as a significant feature in its own right. The LaserJet III uses PCL 5, the new version of the LaserJet machine language that builds the raster, or internal image of the page. With PCL 5, some analysts say, the Palo Alto company could take away sales from Adobe Systems Inc.'s PostScript, which is too powerful and too expensive for most offices.

"The LaserJet is popular in the office because it is faster than PostScript [driven printers]," says Christine Rivera, a New York City consultant who advises corporations on printer purchases.

"The LaserJet line has captured 65 to 70% of the low-end laser printer market," says Mark Boer, market analyst for BIS CAP International, a Norwell, Mass., market research firm. He estimates that the laser printer market, worth $3 billion in 1989 with over a million units shipped, will grow by more than 20% in 1990 to $3.7 billion or 1.3 million units.

Last year HP had 62.9% of the U.S. market in 8- to 10-page-per-minute printers according to Angele Boyd, manager of printer research for Framingham, Mass.-based market research group International Data Corp. (IDC). Apple ran a distant second, with 15.1%. According to BIS CAP, PostScript-based printers make up about 20% of the laser market, driving Apple's LaserWriters, printers that produce slides, desktop-publishing systems and typesetters.

The $2,395 LaserJet III 8-page-per-minute (ppm) printer comes with 22 fonts (versus 14 on HP's $2,695 LaserJet II) and one megabyte of random access memory. With the LaserJet III's scalable font feature, users can increase font size in quarter-point increments from .25 points to 999.75 points without having to buy additional font cartridges. Says consultant Rivera, "Scalable typefaces are what users really want."

Sharper Image

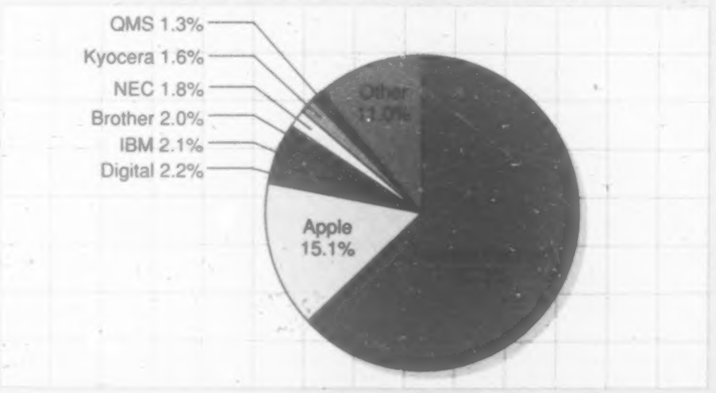
The LaserJet III also offers resolution enhancement, a custom application specific integrated circuit (ASIC) chip that smooths image edges by moving dots to the left or right or by printing them smaller. To BIS CAP's Boer, this 300 dot-per-inch (dpi) printer produces type that "looks more like 600dpi."

Aside from helping to produce better fonts, resolution enhancement boosts the LaserJet's graphics power, says Clay Young, who worked on it's development at HP. With PCL 5 features like arbitrary rotation of text and graphics, the LaserJet can compete with printers that use

HP Commands the Laser Printer Market

In the 8- to 10-page-per-minute laser printer market, Hewlett-Packard rules the roost.

U.S. MARKET SHARE OF UNITS SHIPPED



Source: International Data Corp.

NEW FEATURES OF THE HP LASERJET III, such as font scaling, attract former admirers of PostScript printers.

PostScript. "PCL 5 is supposed to do about 90% of what PostScript does," says Boer.

Missing, however, from the LaserJet III's PCL 5 are PostScript's advanced graphics features such as bezier curves and splines. These shapes require infinitely smooth, mathematically correct curves with constant line weights and arbitrary clipped paths that allow cropping of one shape when placing it within another. Nor does PCL 5 handle color information. But to most observers, these are the specialized needs of publishing professionals, not of the general business world. Although its graphics power doesn't match that of PostScript, LaserJet III does well with bit-mapped images (direct printing of the screen image) and vector graphics (drawings that consist of graphic primitives such as circles and triangles).

Until recently PostScript-based competitors to the LaserJet III usually started at $3,000 to $4,000. Now Dallas-based Texas Instruments Inc. comes closest to the LaserJet III's price tag, offering a 6ppm printer that lists for $2,495. QMS makes a 4ppm PostScript printer for $2,795 and an 8ppm model for $2,995. The 4ppm Apple Personal NT LaserWriter lists for $3,299, and Apple's 8ppm IINT lists for $4,495.

HP's aggressive pricing has had a lot to do with its commanding share of the market. IDC's Boyd says HP is not simply targeting competitors' customers; it is also wooing the customer eying cheaper impact printers. If HP lowers its LaserJet prices enough, surmises Boyd, laser printers will attract a larger segment of the printer market. "People won't pay 50% of their CPU price for their printers, but they will pay 25%. And the closer HP gets to that number the more units they sell."

DATAMATION October 1, 1990

IN FOCUS

LaserJet III

Hewlett-Packard Co.
Palo Alto, CA 94303
Reader Circle No. 150

Features

- 8 pages per minute
- 300 dots per inch (dpi)
- HP PCL 5 page description language
- HP Resolution Enhancement
- 8 internal scalable fonts
- 1 MB memory, with slots available for additional 4 MB

Benefits to IS

- Text and graphics have clean edges
- Fast font scaling up to 999.75 points
- Flexible layout orientations, such as same-page landscape and portrait
- Rotation of text and graphics

Even if PCL 5 does not match PostScript's sophistication, it has finally achieved the level of respectability that HP wanted but did not garner when it introduced the LaserJet II in 1984. Then, rather than offer Adobe's PostScript, over which HP would have exercised little control, HP offered Xerox's DDL printer language at an additional cost. DDL, which provided font-scaling technology to match PostScript's but little of its graphics, failed to catch on.

HP was forced to license PostScript from Adobe and offer it in an add-on board through third-party QMS. In order to add fonts, most customers settled for this hardware option or purchased "downloadable" software fonts.

HP Steamrolls Competition

Few companies dare to compete directly with HP. As Terry Harbin, director of corporate communications at QMS, says, "It's very difficult to compete with HP in PCL printers—they have incredible economies of scale."

Instead, companies like QMS compete by offering a wider range of features and by addressing specialized markets. QMS focuses on printers that combine PostScript with PCL and HP-GL (HP's graphics language). QMS offers automatic switching between languages through its Emulation Sensing Processor, an expert system on a chip that parses the data stream and identifies PostScript, PCL or HP-GL. This feature addresses the mixed platform network, which Harbin estimates is 70% PCs and 30% Apple Macintoshes, where switching the printer from one emulation to another currently must be done manually.

Other companies have moved away from the laser technology of the Canon SX printer engine that underlies the LaserJet. Instead, they're using technology that employs a light-emitting diode (LED) as a dot-by-dot gate though which light passes. The $3,995 Qume CrystalPrint Publisher II uses the Casio LCS-130B LED engine with a PostScript clone and a reduced instruction set computing (RISC) processor that can significantly improve the printer's speed. Okidata also offers LED printers, but because of HP's overwhelming share of the laser market, it not only offers PCL emulation but calls its nonlaser printer the OkiLaser.

No one expects PCL 5 to go head-to-head with PostScript anytime soon. Indeed, HP's own PostScript cartridge has been selling well at $695, despite its requirements for additional memory ($495 for 1 megabyte) and an AppleTalk port ($275). But the influence of the LaserJet's installed base of more than two million users, combined with PCL 5's "good enough" graphics, may easily supplant PostScript for all but the most demanding of users. "We see PostScript reverting to what it was intended to be, which is a high-end graphics program," says BIS CAP's Boer.

One barrier to HP's attempts to sell PCL 5 to sophisticated graphics users is that PostScript is device independent. Unlike PCL code, it can be encapsulated into a stand-alone program and ported to any PostScript printer. Since PostScript has become a standard among high-end lasers, color printers and typesetters, 300dpi office printers such as the LaserJet III are now used to proof work that will be produced in final form on powerful 2,450dpi or higher printers. The LaserJet continues to become more sophisticated, however. "We expect to see PCL typesetters," says HP's Young.

In the meantime, HP's users mostly ignore the technical bounty provided by its page description language. So wary has HP been to drown customers in a sea of information that Berkeley McKennon, Ziff Communications' director of business systems and an accomplished PostScript programmer, says, "No one has really drawn [PCL 5's abilities] to my attention." His only clue to new power PCL's was the printer's manual, which he describes as "frighteningly thick." ▭

Alan Brody is a New York City-based freelance writer.

Sun Microsystems hopes that its SPARCstation SLC will become a champion in business markets.

Sun's Office Contender

SUN'S GREG NICASTRO aims to put PCs and X terminals on the ropes with the SPARCstation SLC.

BY MIKE RICCIUTI

Without question, Sun Microsystems Inc. is the leader in reduced instruction set computing (RISC) workstations. In 1989 the Mountain View, Calif., company commanded a 55% share of the worldwide RISC workstation/server market, according to International Data Corp. Sales of Sun's SPARCstation 1 workstation, in-

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PRODUCT GUIDE

troduced in 1989, outstripped production capacity for a short time. And that machine's successor, the SPARCstation 1+, is selling strongly.

With a comfortable lead established in the technical workstation market, Sun began to look toward new markets, including businesses, this year. To this end, the company introduced the SPARCstation SLC workstation, which put the power of the SPARC-station 1+ —12.5 million instructions per second (MIPS)—in a compact, less expensive package.

One of the features that make the SLC unique is its design. It's made up of just two pieces—a 17-inch monochrome monitor and a keyboard. The central processing unit, floating point unit, memory, Ethernet and small computer systems interface (SCSI) ports are all contained on one 7×9-inch board mounted in the monitor enclosure.

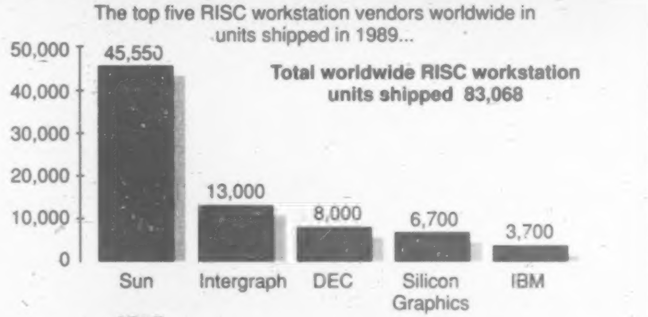
Another feature, is its price: $4,995 ($3,995 in quantity). That puts the SLC squarely in competition with X terminals, high-end personal computers and Apple Macintoshes.

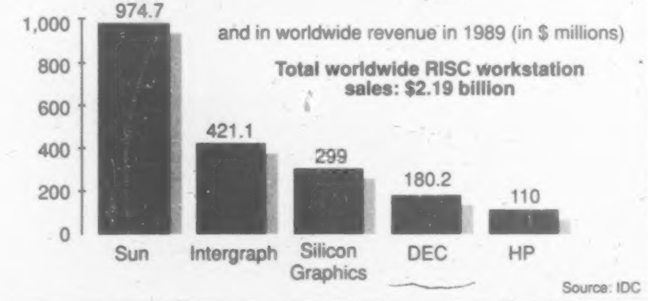
Sun Dawns on the Business Segment

Along with the new design and low price is a new marketing approach. "We see two target audiences for the SLC. First is Sun's traditional customers, like software engineers," says Greg Nicastro, product manager for the SLC at Sun's desktop systems and graphics group in Boston.

"Second, we see the SLC in an emerging market for Sun—business applications." Nicastro says the SLC is targeted at spreadsheet, database and desktop publishing applications—uncharted waters for the company—as well as at Sun's traditional users.

Sun Leads the RISC Workstation World





Source: IDC

DATAMATION October 1, 1990

IN FOCUS

SPARCstation SLC

Sun Microsystems Inc.
Mountain View, Calif.

Base Price: $4,995
Circle No. 199

Product Features:
- 12.5 MIPS processing power
- High-resolution 17-inch monitor

- Compact, two-piece design
- OPEN LOOK graphical interface

Key Benefits for IS:
- Easily networked via built-in Ethernet
- Silent operation
- Low cost
- Bundled software

But Sun's penetration into markets other than technical and engineering may take a while, says Tom Kucharvy, president of Summit Strategies, a Boston computer industry market research group. "It will depend on the availability of applications. I don't think Sun expects to displace PCs in office applications for some time," he says.

In Sun's bread-and-butter technical market, though, the SLC stacks up just fine, says Jack Thompson, manager of Cray Research Inc.'s workstation resources group. After beta testing the SLC for several months, Thompson decided to replace his department's desktop network with SLCs.

"Before we went with the SLC, we looked at X terminals and decided that the SLC gave us more for the money," says Thompson. So far, Cray has installed more than 500 SLCs.

An Alternative to X Terminals

Ed Keegan, director of development and operations at New Haven, Conn.-based Yale University's department of computer science, beta tested an SLC as a diskless client off a server.

"We tried out X terminals, but we weren't satisfied with the performance. For the same money, you can go out and buy a machine like the SLC, which runs faster," Keegan says.

Both Keegan and Thompson admit that SLC users say they miss a color display, and Keegan says a local floppy-disk drive would help. But Sun has already responded to that wish. In July the company announced the SPARCstation IPC, which sports a 16-inch color monitor and floppy-disk drive for $9,995.

"We've positioned the SLC as a low-cost network node for applications where color isn't important," says Sun's Nicastro.

Laura Canigliaro, an analyst at Prudential Bache Securities Inc. in New York City, thinks many buyers agree with Sun. "I didn't think Sun would ship as many SLCs as they have, but they have obviously found a niche. They are going head-to-head with X terminals and high-end PCs, and so far they have no direct competition. The SLC has definitely dealt a blow to those machines in the engineering area." ▭

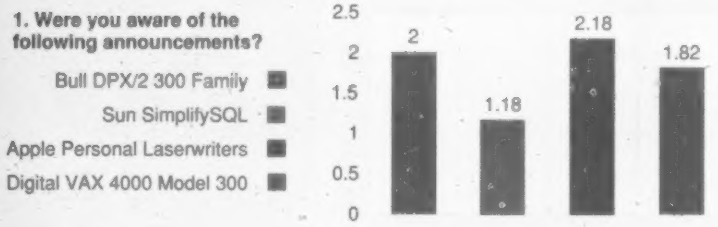
DATAMATION'S

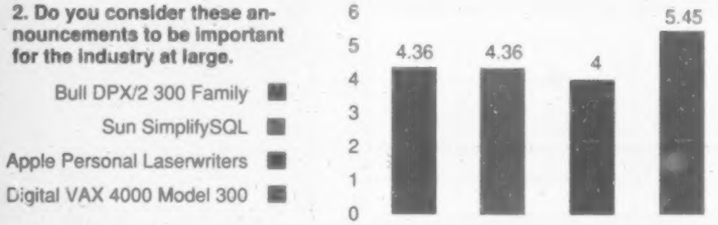
USER PRODUCT REVIEW

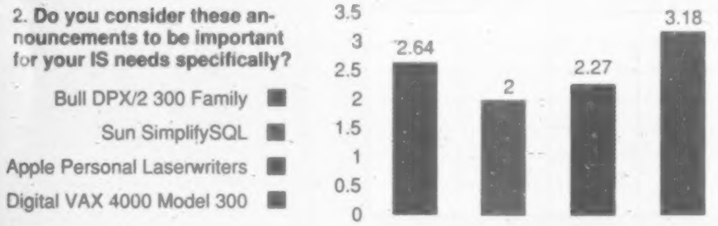
Digital's VAX 4000 Scores Well

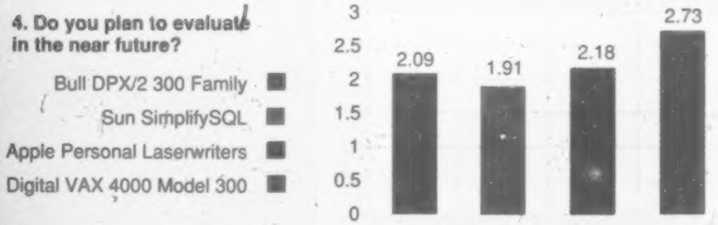
Pick of the Pack

The DATAMATION Review Panel was asked the following four questions for each product and asked to respond on a scale of 1 to 10, with 10 being the highest level of response. The results represent the average of all responses for each question.


1. Were you aware of the following announcements?


2. Do you consider these announcements to be important for the industry at large.


2. Do you consider these announcements to be important for your IS needs specifically?


4. Do you plan to evaluate in the near future?

The Lineup

Digital Equipment Corp. of Maynard, Mass., introduced the VAX 4000 model 300 in July, a mini-VAX that provides the power and performance of a midrange computer in a system the size of a two-drawer file cabinet. The new VAX is available in both server and time-share models and is priced from $79,900.

CIRCLE NO. 180

Bull HN Information Systems Inc. of Billerica, Mass., introduced four new systems in June, including two entry-level systems and two mainframes. The new systems are all UNIX-based and include the company's first reduced instruction set computing (RISC)-based system. Prices on the new systems begin at $36,000.

CIRCLE NO. 181

Sun Microsystems Inc., of Mountain View, Calif., released SimplifySQL in July, a set of software tools designed to simplify access to and control of Ingres, Oracle and Sybase databases on Sun's SPARCstation workstations. SimplifySQL is priced at $995.

CIRCLE NO. 182

Apple Computer Inc. of Cupertino, Calif., introduced two LaserWriter printers in July for its Macintosh computers. The Personal LaserWriter SC is designed for individual users and is priced at $1,999. The Personal LaserWriter NT is meant for networked applications and is priced at $3,299.

CIRCLE NO. 183

DATAMATION'S User Product Review is conducted twice a month by a panel of the magazine's readers. Panel members base their judgments on published information about each of the products under review. Their responses are sent to DATAMATION by fax. If you wish to join DATAMATION'S User Product Review Panel, call Bob Sawyer, Senior Editor, New Products, at (617)-558-4438; write to him at 275 Washington St., Newton, MA 02158; or fax him at (617)-558-4506.

New IS Indicator Reveals Healthy Rate of Orders

Editor's Note: Market Insights is a new department that will appear in every issue of DATAMATION. *In the first issue of each month, Cahners Economics will provide the results of the new* DATAMATION IS *Performance Indicator, which is intended to track the economic health of the information systems industry. In the issue dated the 15th, we will track macroeconomic trends. On the following page in every issue, the Cahners Business Research Group will report on its ongoing survey of how* DATAMATION *readers are implementing new technologies.*

BY MADELINE FRANCHI
Cahners Economics

DATAMATION's newly developed Information Systems Performance Indicator, which is designed to track the health of the IS industry, reached its most recent peak level back in March 1989. Since then, the indicator, which has been calculated as far back as 1984 using historical data, has slowly inched downward. The decline resulted from broad-based weakness in most of the components (see box, "Methodology"). Inventory growth of IS equipment has been shrinking and in May actually dropped below last year's levels. At the same time, business investment in new plants and equipment sank from $41.9 billion in May 1989 to $40.7 billion this past May.

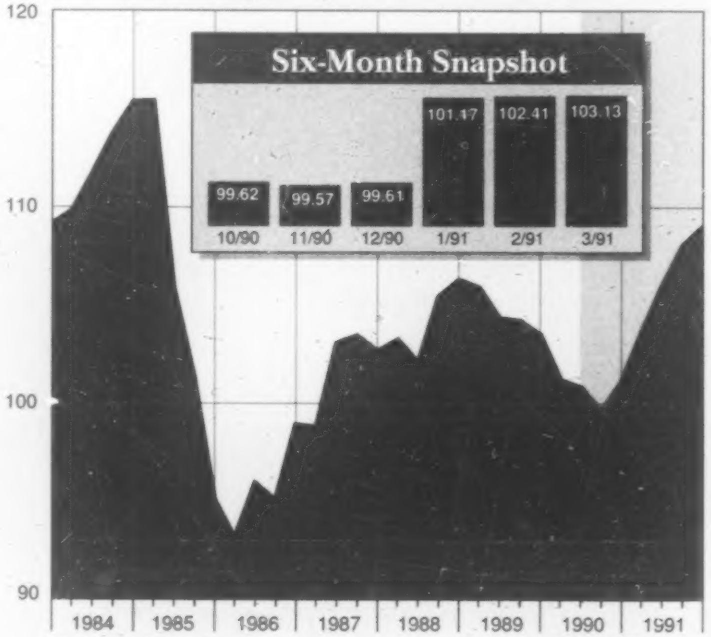
Manufacturers can take some solace in the fact that new orders remain healthy relative to last year's levels. The strength shown here is a good sign: the business cycle will soon hit its low. Cahners Economics predicts that the performance indicator will turn around later this year and head into a sustained recovery through 1991. ▭

Methodology

The DATAMATION Information Systems Performance Indicator is based on weighted moving growth rates for five statistics: 1) IS inventory, 2) new IS orders, 3) average weekly hours of computer industry production workers, 4) Standard & Poor's computer systems stock price index, and 5) contracts and orders for plants and equipment. For more information on Cahners Economics' forecasting services, contact Dan Buchan at (617)-630-2105, by fax at (617) 630-2100 or write him at Cahners Economics, 275 Washington Street, Newton, MA 02158.

The IS Performance Indicator

The health of the IS industry is expected to improve later this year and into 1991.



*Shaded area denotes forecast

Source: Cahners Economics

	May	April	% Change	May 1989	% Change 1990/1989
■ **Information-Processing Equipment**					
Shipments (SA, $ millions)	9,880	9,852	0.3	9,429	4.8
New Orders (SA, $ millions)	9,902	9,995	-0.9	9,093	8.9
Unfilled Orders (SA, $ millions)	28,602	28,580	0.1	28,605	0.0
Inventory (SA, $ millions)	21,615	21,620	0.0	21,780	-0.8
■ **Computer Production Workers**					
Employment (NSA, thousands)	125.1	126.3	-1.0	129.0	-3.0
Average Weekly Hours (monthly avg.)	42.2	41.8	1.0	41.4	1.9
■ **Stock Index**					
S&P's Computer Systems Stock Price Index	191.97	181.58	5.7	189.60	1.3
■ **Contracts & Orders**					
New Plant & Equipment (SA, % billions)	40.59	40.67	-0.2	41.9	-3.1

SA= seasonally adjusted;
NSA= nonseasonally adjusted

Sources: U.S. Commerce Dept and Standard & Poor's; forecasts Cahners Economics

How Extensive Is Downsizing?

BY WARREN CHILDS
Business Research Group

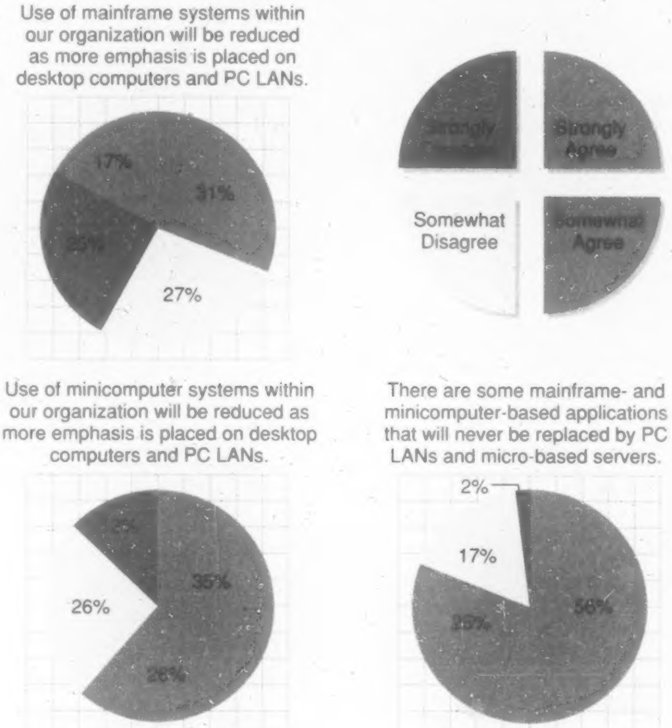
Without doubt, the implementation of powerful desktop computers, high-performance micro-based servers and effective local area network (LAN) communications has affected the role of mainframe systems and minicomputers in many organizations. However, the effect of downsized information systems has been greatly exaggerated, according to DATAMATION's new High Technology Panel.

More than 80% of panel members, who are readers of the magazine, agree that some mainframe and minicomputer applications will never be replaced by desktop computers and PC LANs.

Although many personal productivity applications are being moved from the mainframe to the desktop, large-scale applications that require large databases and support hundreds of users simultaneously will continue to be run on mainframes. Less than half of the panel members say that networked desktop computers have reduced the mainframe's role in their organizations.

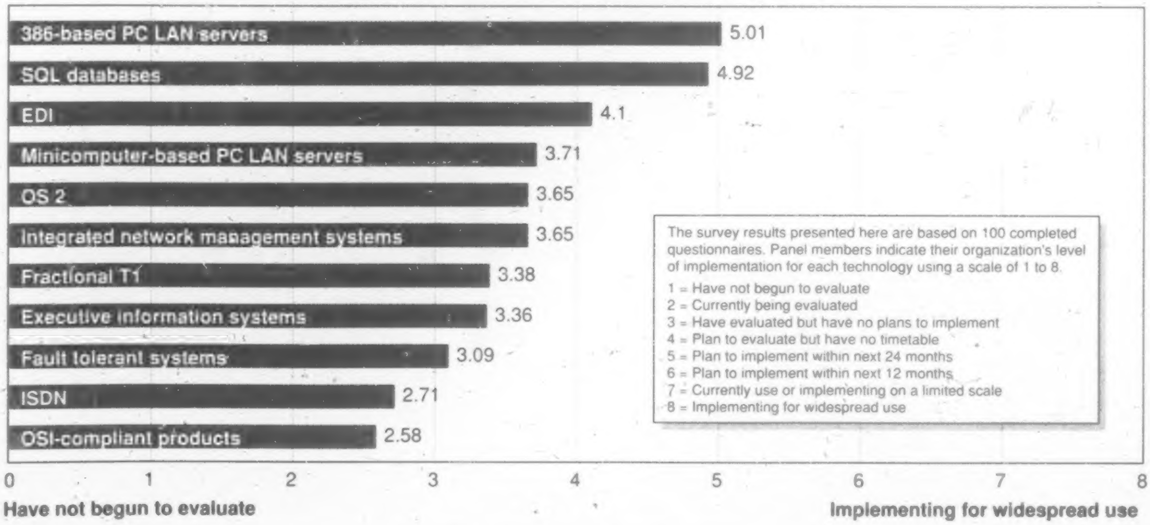
Minicomputer systems have been somewhat more affected by micro-based servers taking over their role as departmental computers. In fact, 60% of panel members report a reduced role for minicomputers due to PC LANs.

There's Life Yet in Large Systems



DATAMATION's Technology Implementation Index

DATAMATION each month surveys a select group of its readers– the DATAMATION High Technology Panel–to investigate the implementation of new technologies by key end-user organizations.



The survey results presented here are based on 100 completed questionnaires. Panel members indicate their organization's level of implementation for each technology using a scale of 1 to 8.

1 = Have not begun to evaluate
2 = Currently being evaluated
3 = Have evaluated but have no plans to implement
4 = Plan to evaluate but have no timetable
5 = Plan to implement within next 24 months
6 = Plan to implement within next 12 months
7 = Currently use or implementing on a limited scale
8 = Implementing for widespread use

E. F. Codd on: Mastering the Art of Database Fusion page 61

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178 TOTAL PAGES

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FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

OCTOBER 15, 1990

Brooks Freeman,
AIX marketing
development manager,
IBM, with the RS/6000

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Big Blue's Red Hot Workstation

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Apple's Sequel To SQL *page 33*

A Do-It-Yourself Guide To PC Repair *page 39*

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PAGE 97

OCTOBER 15, 1990

VOLUME 36
NUMBER 20

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

RISC System/6000
Calculator
Bitmap
Clock
InfoExplorer
Printer
Shell
System Management

The RS/6000 reestablishes IBM's lead in the RISC world.

COVER STORY

Big Blue's Red Hot Workstation 28

BY BOB FRANCIS Bred for speed and compatibility, IBM's impressive new RS/6000 workstation is stirring widespread interest across the computing spectrum. But not all IS managers are convinced that IBM's latest RISC is a sure bet.

Cover photography by Peter Silvia Jr./Black Star

PCs & WORKSTATIONS

CONNECTIVITY

Apple's Sequel to SQL 33

BY JEFF MOAD Apple Computer was so impressed with the capabilities of the CL/1 connectivity language that it bought the company that invented it. Now Apple has to decide whether to promote the product as just a Macintosh or an industrywide solution.

PRODUCT GUIDE

SQL Server Power! 83

BY MIKE RICCIUTI DataEase SQL enables users to move between databases in a client/server architecture.

DataEase's Barca-Hall welcomes queries.

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MAINTENANCE

A Do-It-Yourself Guide to PC Repair 39

BY DENISE WORHACH Shocked by the size of your PC maintenance bill? Look to Novell, Auburn University and the Tennessee Valley Authority for examples of efficient, self-run maintenance departments.

NETWORKS

ELECTRONIC MAIL

Mail Messages That Cut Red Tape 47

BY STEPHEN A. CASWELL Now that it has glued five separate e-mail systems together, Hughes Aircraft is setting up an electronic forms-routing and approval system that will speed up business processes.

DATA STORAGE

Now Playing: Compact Disks on LANs 55

BY TOM McCUSKER Now CD-ROM readers can be networked, cutting cost per user. For work groups, this shared resource can bring surprising savings. But pricing schemes are still controversial.

SOFTWARE

DATABASE MANAGEMENT

Mastering the Art Of Database Fusion 61

BY EDGAR F. CODD Merging two or more independently conceived relational databases into a single one is no simple task, but every good database administrator should know how. Here's some advice from the master of relational database management.

EXPERT SYSTEMS

Users Now Hail Expert Systems Upgrade 69

BY TOM McCUSKER It wasn't exactly war, but at last year's user group meeting when Level Five Research announced plans to wipe out the old version of Level5 and replace it with a hot new upgrade, the users started shooting.

SYSTEMS

TECHNICAL COMPUTING

Shopping for Supercomputers 76

BY GORDON BELL AND GLEN MIRANKER In the market for supercomputing? Look beyond Cray supercomputers, IBM mainframes, Alliant minisupers and Digital minis. Instead, discover the power of superworkstations.

TVA's Zarski, inside outsourcing, page 39.

Confusion over fusion, page 61.

Level Five's Silar, recommitted to users, page 69.

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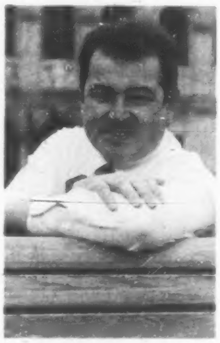
The Real Promise of the RS/6000

When IBM introduced its RS/6000 workstation family this past spring, the performance and price of the line impressed many in the IS profession. At the starting gate, the low-end POWERstation 320 is rated at 27.5 million instructions per second and priced at $12,995. That converts to $472.55 per MIPS—an aggressive price/performance point by any measure.

The combination of the machine's price/performance; its reduced instruction set computing design; and AIX, IBM's version of the UNIX operating system, has drawn the attention of computer buyers from all sectors of industry and commerce. But what perhaps makes the RS/6000 most noteworthy is not its technical achievements or its price or even the powerful benefits associated with being a machine made by the world's largest computer company. What makes the machine so interesting, and perhaps significant, is IBM's plans to integrate the computer into its vision of enterprisewide computing networks. With the RS/6000, its new System/390 large-scale systems and associated products, and with System Application Architecture, IBM is clearly attempting to craft an approach to linking various computing platforms into a rational whole.



FRANCIS: Focusing on interoperability

We think it's important to look at the RS/6000 in this emerging context. IBM does not have all the pieces together yet—the still unclear role of AIX in SAA is but one question. But the company has been clear about its intentions. As Dallas bureau manager Bob Francis writes in this issue cover story, "Big Blue's Red Hot Workstation," page 28, The machine's "credentials combined with at least a promise of enterprisewide interoperability have IS managers looking beyond IBM's original positioning of the machine as a technical workstation. Now they're looking at the machine's potential for integration into existing corporate networks and as a platform for systems development."

Brooks Freeman, a member of the RS/6000 development team, drives the point home. "To be interoperable with the databases residing on the 3090 was essential," he says.

So as you read our story think about the larger context. It's this context that reveals the real promise of this truly red hot workstation.

You Make the Call

Over the past several years, DATAMATION has made a concerted effort to get closer to you, our reader. One of the main ways we've done this is through our coverage of user groups. Now, we're going a step further in asking you to vote for the truly significant products introduced over the past year. In our first Products of the Year Contest, page 97, we have assembled more than 100 candidates for you to choose from. Go through the descriptions in the PCs & Workstations, Networks, Software, Systems and Peripherals categories, pick your favorites and vote on the enclosed card. We'll announce the winners in our February 15, 1991 issue.

Also of particular note in this issue is the first of a two-part article by Edgar F. Codd, "Mastering the Art of Database Fusion," page 61. This paper, by the developer of Relational Model, tells you how to combine two different database systems. And C. Gordon Bell, who led the VAX development team at Digital Equipment Corp., coauthors with Glen Miranker a discussion of alternate forms of supercomputing. Check out "Shopping for Supercomputers," page 76.

David R. Brousell, Editor

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DataEase International's DataEase SQL enables users to move between databases in a client/server architecture.

SQL Server Power!

DATAEASE'S BARCA-HALL thinks DataEase SQL will tower over its competition.

BY MIKE RICCIUTI

There was a time when users wanting to pull information from vast corporate databases had to log on to the nearest mainframe or minicomputer and use cryptic programming codes—or not much less cryptic Structured Query Language (SQL), the de facto standard for relational database communications.

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PCs & WORKSTATIONS
NETWORKS
SOFTWARE
SYSTEMS
PERIPHERALS

Photograph by Bob Kurst/Black Star

But times have changed. A program recently introduced by DataEase International, called DataEase SQL, translates user-friendly queries made on a personal computer into Structured Query Language (SQL), for seamless access via a network to multiple databases on different types of machines.

Borland International Inc., Gupta Technologies Inc. and Software Publishing Corp., offer a similar class of products, but at presstime, none had moved distributed database management into a client/server environment. DataEase SQL splits up database requests from network PC users and sends them to the appropriate database server, whether the database exists on a PC, minicomputer or mainframe. Only the necessary data are then routed back to the user, minimizing network traffic.

DataEase International, based in Trumbull, Conn., is a company better known for its database management system (DBMS), DataEase, which has the PC database software world's second largest installed base, after Ashton-Tate' Corp.'s dBASE, according to the Framingham, Mass.-based market research firm International Data Corp.

DataEase SQL consists of two modules: the DataEase module, which replicates the look and feel of the company's database product for applications development and execution, and the PRISM module, which is a processing router.

The PRISM section contains drivers that tie the DataEase applications development interface to the server software of multiple databases. Through PRISM, all DataEase commands are translated, transparently to the user, into SQL statements

The initial version of DataEase SQL, shipped in September, included PRISM drivers for access to Microsoft Corp.'s SQL Server, version 1.1 or later. The company plans to release drivers over the next six months that tie the product to IBM's OS/2 Extended Edition Database Manager, Micro Decisionware Inc.'s Database Gateway for DB2 Access, Oracle Server (for UNIX and Digital VAX/VMS databases) and Teradata Corp.'s DBC/1012 database computer system. The base product price is $995. Each PRISM driver is priced at $1,500. Workstation support is priced incrementally at $1,750 for every five users.

"Our potential customers for DataEase SQL are people who want the ability to use local area network technology in the same way as mini and mainframe computers, through a client/server architecture," says Jeffrey Barca-Hall, DataEase's director of product development.

Jim Louderback, a technical manager at American Management Systems Inc., an applications consulting firm in Roseland, N.J., beta tested DataEase SQL for six months prior to its release. The firm developed a telemarketing system for 65 users based on DataEase SQL and a client/server architecture, using a Compaq 386-based personal computer as the server. "Two years ago, this type of system would have been developed on a mainframe," he says.

An important feature of the product, Louderback adds, is that it's easy to use. "I can get a system with a large number of users up and running in a very short time with DataEase SQL," he says.

Pushing SQL Into the Maintream

"Because of products like DataEase SQL, SQL database engines will enter the mainstream business market," says Marshall Mosley, a software analyst at the San Jose-based market research firm Dataquest Inc.

Adds Dataquest's Mosley: "There is only a small market for this type of product now. DataEase is betting on the future, but I think it is an extremely smart bet."

DATAMATION October 15, 1990

IN FOCUS

DataEase

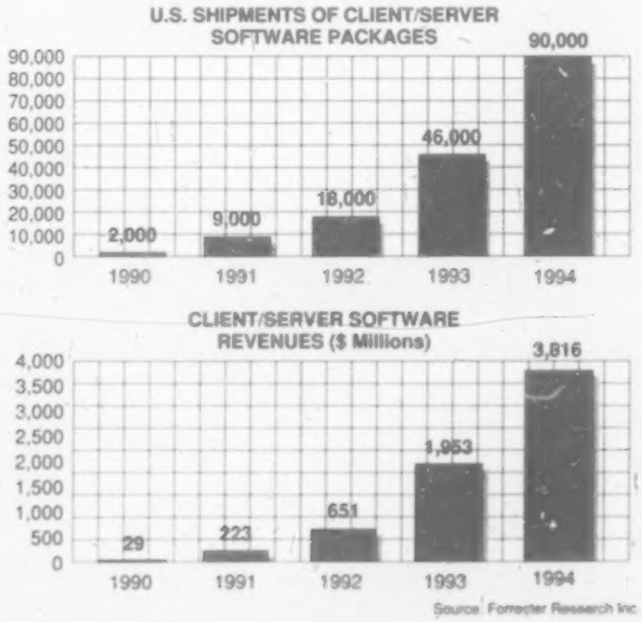
DataEase International, Inc.
Trumbull, Conn [illegible]611
Price: $995
Circle No. 205

Product Features:
- Large-scale database application development on PCs
- Translates database queries into SQL
- Allows access to multiple databases
- Uses a client/server architecture

Key Benefits to IS:
- Fast system development
- Easy ties to existing databases
- Ease of use
- No need to use "C" code

Client/Server Software Picks Up Momentum

The market for client/server software is small today but is projected to grow 45-fold in the next five years.



Source: Forrester Research Inc.

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DATAMATION'S

USER PRODUCT REVIEW

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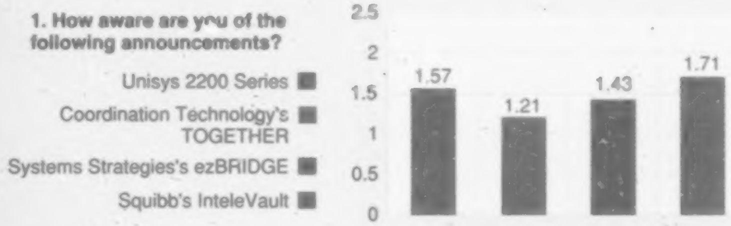
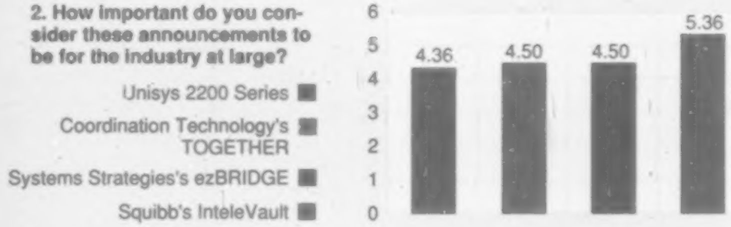
Squibb's InteleVault Locks Up Top Spot

Pick of the Pack

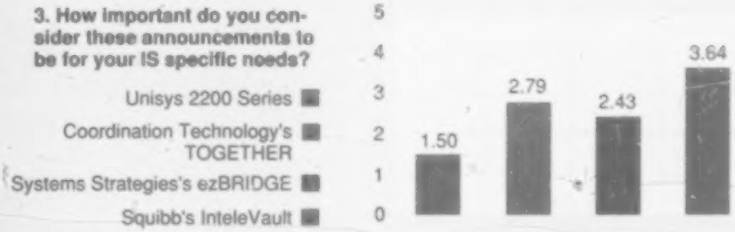
The DATAMATION Review Panel was asked the following four questions for each product. Panel members were asked to respond on a scale of 1 to 10, with 1 meaning ""not very" and 10 meaning ""extremely." The results represent the average of all responses for each question.



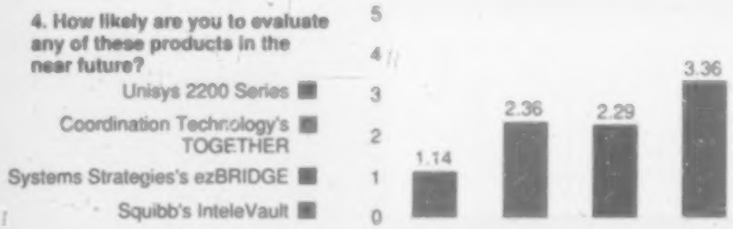
1. How aware are you of the following announcements?



2. How important do you consider these announcements to be for the industry at large?



3. How important do you consider these announcements to be for your IS specific needs?



4. How likely are you to evaluate any of these products in the near future?

The Lineup

Unisys Corp. , of Blue Bell, Pa., announced new mainframe computers in July, including three new series—the A16, the 2200/600 Evolutionary System and the 2200/100 series—as well as four new models in the existing A12 series. Prices begin at $115,000.

Circle No. 270

In June **Coordination Technology Inc.**, based in Trumbull, Conn., announced TOGETHER, a groupware software product for networked personal computers. TOGETHER runs on top of network software and lets users share work and send and receive messages in a client/server environment. The product is priced from $9,995.

Circle No. 271

Squibb DataSafe Systems Inc. of Kingston, N.Y., announced the InteleVault off-site backup service in July. The company says the service allows companies to store large amounts of data off site via telephone line. The price of the service begins at less than $2 per day, the company says, and is based on the volume of data stored.

Circle No. 272

Systems Strategies Inc., a NYNEX company based in New York City, announced the ezBRIDGE Peer-to-Peer Productivity Tools in July. The software tool package provides communications services to developers building multivender LU6.2 applications on Digital VAX/VMS systems and on IBM AS/400 systems. Prices begin at $15,000.

Circle No. 273

DATAMATION's User Product Review is conducted twice a month by a panel of the magazine's readers. Panel members base their judgments on published information about each of the products under review. Their responses are sent to DATAMATION by fax. If you wish to join DATAMATION's User Product Review Panel, call Bob Sawyer, Senior Editor, New Products, at (617)-558-4438; write to him at 275 Washington St., Newton, MA 02158; or, of course, you can fax him at (617)-558-4506.

Service Sector Keeps on Chugging

Editor's Note: Market Insights is a new department in DATAMATION that will be appearing every issue. On the first of each month, Cahners Economics will provide the results of the new DATAMATION IS Performance Indicator, which is intended to track the economic health of the industry. On the 15th of each month, we will track macroeconomic trends. On the following page in each issue, Cahners Business Research Group will provide the results of surveys of DATAMATION readers. These surveys will examine how user organizations are implementing new technologies.

BY MADELINE FRANCHI
Cahners Economics

Amid seemingly constant reports of yet another savings and loan in trouble, another investment firm announcing layoffs or another condominium project going belly up, it's easy to come away with the impression that the U.S. service sector is in trouble. The fact is, though, that the sector remains the fastest-growing segment of the U.S. economy. The news of the day, however, is reflected in projections that the sector will grow at a slightly slower pace in 1990 than it did in 1989. Cahners Economics expects consumer spending on all services to grow at an inflation-adjusted rate of 2.5% in 1990, down from 1989's 3.7%, but higher than the rate of consumer spending for both durable and nondurable goods.

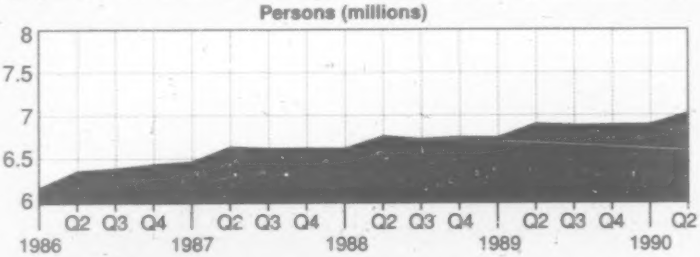
And, despite the S&L nightmare and shrinkage in the banking and brokerage industries, employment in the finance, insurance and real estate sector (including IS employees working for those financial institutions) is at a record level.

As of June 1990, 7 million persons held jobs in the financial services industry, the highest monthly level ever recorded and 1.8% more than in June 1989. More bodies usually means more demand on the IS department, a fact underscored by figures showing that employment at computer vendors was a healthy 7.9% higher in June 1990 than it was in June 1989.

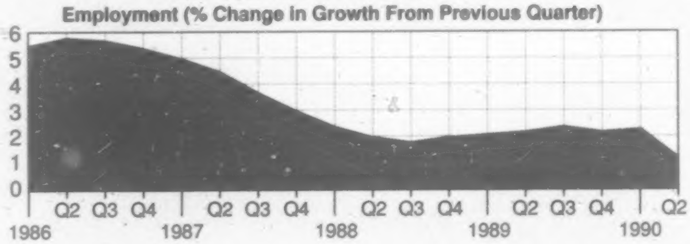
For more information on Cahners Economics's forecasting services, contact Dan Buchanan at (617)-630-2105, by fax at (617)-630-2100 or write to him at Cahners Economics, 275 Washington Street, Newton, MA 02158.

A Macroeconomic View of the U.S. Service Sector

Employment in the Finance, Insurance and Real Estate Sector Is Still Heading Up...



But Not as Fast as in Previous Years



	Annualized % growth		Annual % growth		
	Q1/90	Q2/90	1990	1991	1992
Gross National Product	1.7	1.2	1.4	2.3	2.2
Business Investment in Equipment	5.7	-6.2	1.5	4.6	3.3
Government Spending	2.9	6.2	2.0	1.3	0.5
Consumer Spending	1.1	-0.3	1.0	2.0	2.1
Exports	11.2	-3.7	6.0	3.3	4.7
Imports	2.5	3.2	3.5	2.2	2.9

All calculations are in 1982 dollars; quarterly figures are seasonally adjusted.

Source: Commerce Dept. and Cahners Economics

	June	May	% Change	June 1989	% Change
Manufacturing Production (1)					
Process Industries Total	108.5	107.6	0.8	107.6	0.8
Chemicals	110.5	109.5	0.9	109.1	1.3
Petroleum	108.6	106.3	2.2	106.6	1.9
OEM Total	115.1	114.2	0.8	113.2	1.7
Computers & Peripherals	148.2	149.0	-0.5	139.1	6.5
Communication Equipment	110.6	109.0	1.5	106.0	4.3
Transportation Equipment	111.4	109.1	2.1	109.0	2.2
Services Employment (2)					
Finance, Insurance, Real Estate	7.003	6.928	1.1	6.878	1.8
Health Care	8.209	8.120	1.1	7.646	7.4
Computer & Data Processing	0.820	0.813	0.9	0.760	7.9
Transportation/Utilities	5.948	5.896	0.9	5.753	3.4
Retail Trade	19.996	19.825	0.9	19.727	1.4
Wholesale Trade	6.390	6.343	0.7	6.266	2.0
Government	18.494	18.832	-1.8	17.792	3.9

(1) Index 1978=100, seasonally adjusted
(2) Millions of persons, not seasonally adjusted

Who Cares About This Networking Standard?

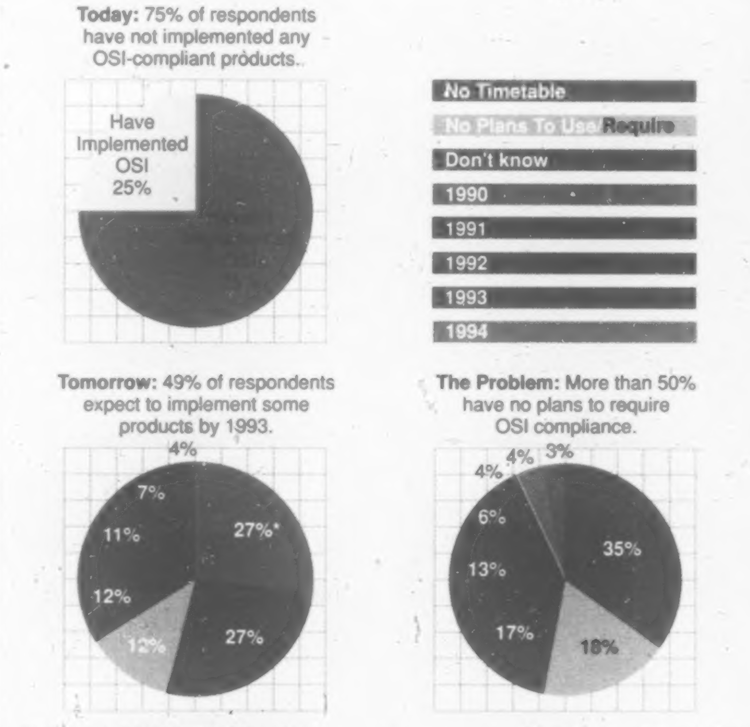
BY WARREN CHILDS
Business Research Group

As sharing information becomes increasingly important, users are seeking ways to integrate their disparate multivendor systems. One solution to this integration problem is the Open Systems Interconnection (OSI) standard. The implementation of OSI-compliant products would allow users to integrate computing resources from a number of vendors. But users are approaching OSI-compliant products cautiously. This caution is born partly out of concern that OSI products from different vendors may still be incompatible. But, more important, investments in proprietary systems are too great for many users to risk the expense and training involved in implementing an unproven standard.

The results of the DATAMATION High-Technology Panel survey reflect the cautious approach many are taking toward OSI implementation. Only 25% of panel members have implemented OSI-compliant products. Less than half expect to implement any OSI products by 1993.

With less than one-third of the panel members planning to require OSI compliance, vendors with large installed bases of proprietary systems may see little incentive to become fully compliant with the OSI standard. ▭

Most Users Show Little Interest in OSI

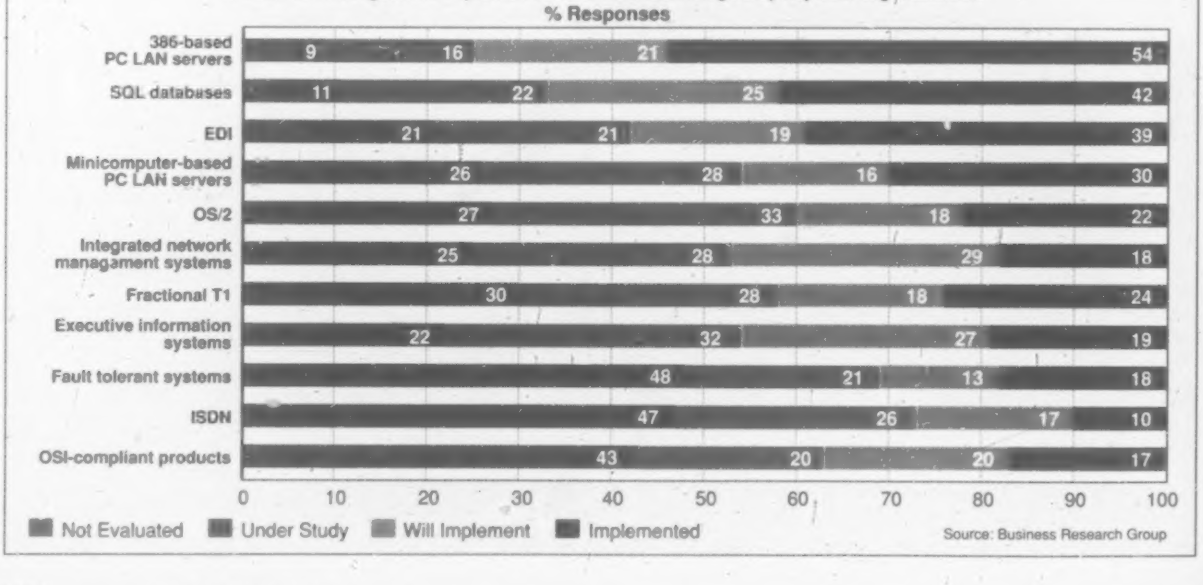


*Includes those already using OSI products

Source: Business Research Group

DATAMATION's Technology Implementation Index

DATAMATION each month surveys a select group of its readers–the DATAMATION High Technology Panel–to investigate the implementation of new technologies by key user organizations.



Source: Business Research Group